JULY, 1946

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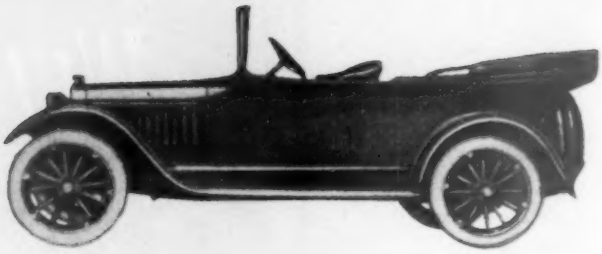
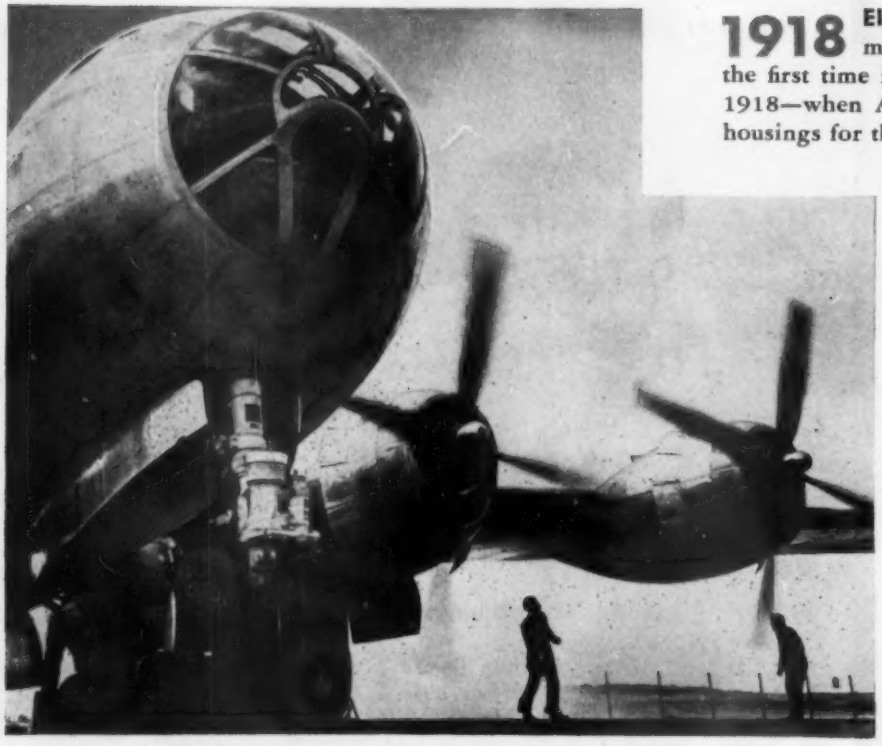
1918 Motor Cars and 1946 Planes

WELDING MADE THEM POSSIBLE





1918 **Electric arc welding,** as a practical mass-production tool, was used for the first time in the building of automobiles in 1918—when A. O. Smith welded the rear axle housings for the 1919 Chalmers motor car.

1946

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★ DESIGN

Weld-Fabricated Reduction Gears

BY GEORGE L. SNYDER

Assistant Manager, Development Engineering
Lukens Steel Co., Coatesville, Pa.

The greatest unexplored field today is the design possibilities that are inherent in the fabrication of welded steel. The potentialities are almost unlimited.

About 15 years ago when treaty limitation was one of the design criteria for our Navy ships, Lukenweld, Inc., a division of Lukens Steel Co., Coatesville, Pa., began to collaborate with the DeLaval Steam Turbine Co., Trenton, N. J., on the development of propulsion machinery of welded design. At that time reduction of weight and space without loss of power output were important factors in the design of ship-propulsion machinery, as is still true today.

Casting vs. Welding

It is hardly possible to discuss the subject of welded design for marine propulsion units without contrasting its aspects with phases of the foundry industry because structural parts of machinery in general have traditionally been castings. However, no implication is intended here that a struggle for survival between the foundry and weldery should exist. Each has its proper place, and both are vital to industry.

Cast gears, gear housings and turbine cases have been used for many years despite their size and complexity, which required that they be made in small units and assembled by riveting or bolting. These methods proved cumbersome and costly. Today, through the use of welded steel plate, the number of main units of a gear reduction drive is comparably fewer. Materials are selected to give a combination of strength, hardness, weldability and machinability.

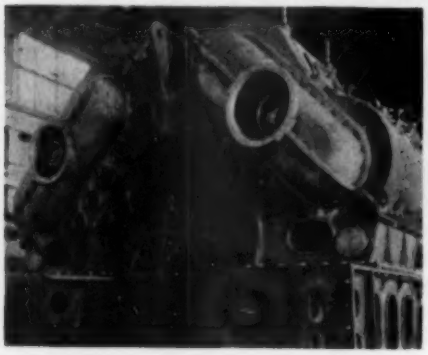
The gear shown in Fig. 5 is a casting with a forged band shrunk onto the body and then hobbed. This gear weighs approximately 40,000 lb. By using welded construction, we were able to design a gear to replace it at a saving of ten tons in weight, for the welded gear weighs approximately 20,000 lb.

During the designing of the welded gear, several small steel models were made of both a spoked gear and a conical web gear. They were supported at the hub and a load was applied at increments around the rim. Fig. 12 shows the type of gears employed together with deflections which are characteristic of the two types. The curves resulted from the application of two loads, 220 and 720 lb. to the spoked and conical web models. The resulting distortions of the rims of both types for each load were then plotted as ordinates and the equidistant points around the rim as abscissas. The cone construction has uniform deflection from point to point around the periphery while the spoked construction

Fig. 1—This positioner rotates the rotor under an automatic-welder

Fig. 2—This specially designed "L" positioner allows the work to be turned 360 deg in any direction

Fig. 3 — Completely welded gear case ready for installation in a ship



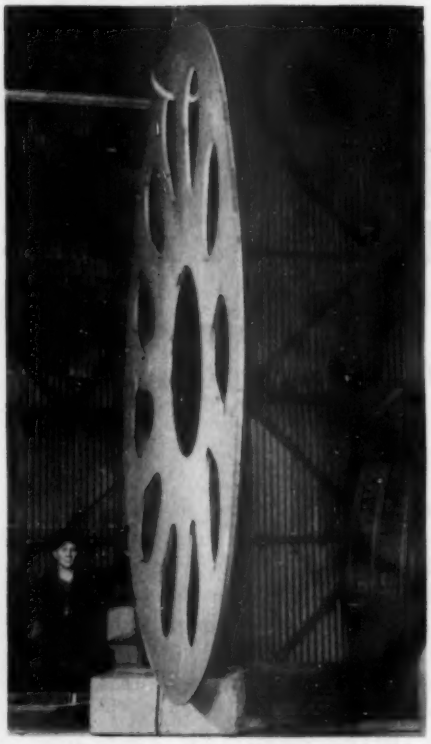
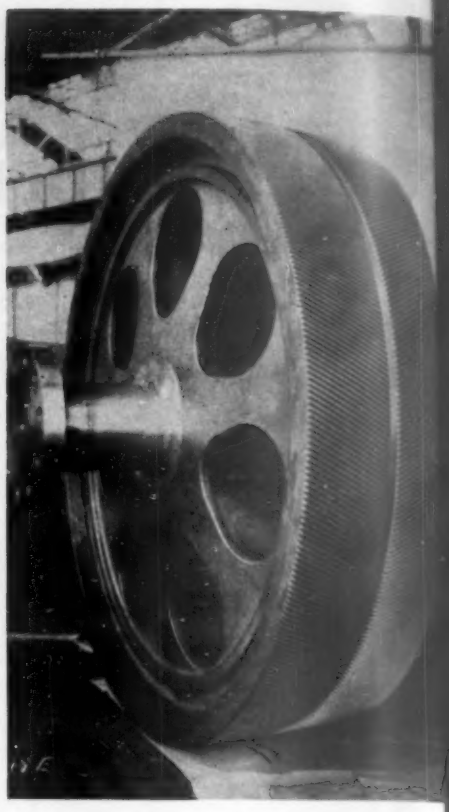


Fig. 4—Each of the four webs is flame-cut from a single plate. The holes, also flame-cut, reduce weight, provide access for welding

Fig. 5—Cast gear. The forged band was shrunk onto the body



shows a variation of deflection of some 100% between the radial webs. Needless to add, perhaps, the cone construction was adopted.

Several other advantages accrue when the webs are formed as cones. The operation of welding the first web to the rim and hub tends to induce radial stresses. Due to the conical shape of the web, however, such tendency is dissipated in an axial movement of the hub. After the second cone has been assembled, the structure is, of course, thoroughly tied in together, and its resistance is great to such axial loads as might occur in a helical gear.

Fig. 13 shows the elastic deflection characteristic under an axial load and affords a comparison between the spoked and cone construction for an equivalent amount of material. The cone construction has roughly 78% of the axial deflection of the spider construction. The weight reduction in these parts is quite obvious; plate thicknesses can be reduced and no radial stiffeners are required. Since it is not necessary to assemble and weld these stiffeners, the man-hours to produce this type of gear are also reduced.

As we know, lesser weight in naval craft means that greater fire power can be obtained with the minimum displacement of the ship. In our merchant vessels, the less the ship's parts weigh, the greater is its pay load.

Fabrication Procedure

Based on the results of the deflections shown in Figs. 12 and 13, hundreds of gears have been produced according to the conical design. Fig. 7 pictures a welded gear blank for a naval transport using this type of construction. It is made of a forged rim, four webs and a hub. The gear blank is 140⅜ in. in diameter, has a face of 37 in. and weighs approximately 32,000 lb. Because of limitations on size and availability of the forgings, the rim had to be made in two parts and joined by a circumferential weld. The forgings from which the rim was formed have an analysis of 0.35 to 0.40% carbon and 0.90% manganese with Brinell hardness of 160 to 190 after stress relief. The two big forgings are tacked together and placed on a special welding positioner (Fig. 11) which rotates the circular assembly so that all welding can be performed in the downhand position. After welding, the rim is bored on the inside diameter for close tolerances. The hub is made from either a forging or from a casting and turned on the outside diameter.

The webs (Fig. 4) are first flame-cut on the inside and outside diameters from a single steel plate 15/16 in. thick. The holes are also flame-cut. They are used to provide access for welding as well as to lighten the weight of the structure. An unequal number of arms are formed so that no two arms will be directly opposite. The openings are ground to remove any torch marks or undercuts that may cause failure in pressing or in service, and the flame-cut plates are shaped on a 1,500-ton hydraulic press to a 5-deg conical slope. After pressing, the outside and inside diameters are machined, and the welding kerfs are machined at the same time.

Gear Heated During Assembly

The assembly of this gear is started by heating the rim to a temperature of approximately 250 F with a ring-type burner, as shown in Fig. 8, while the hub is placed in the center and the webs assembled. The rim is heated because

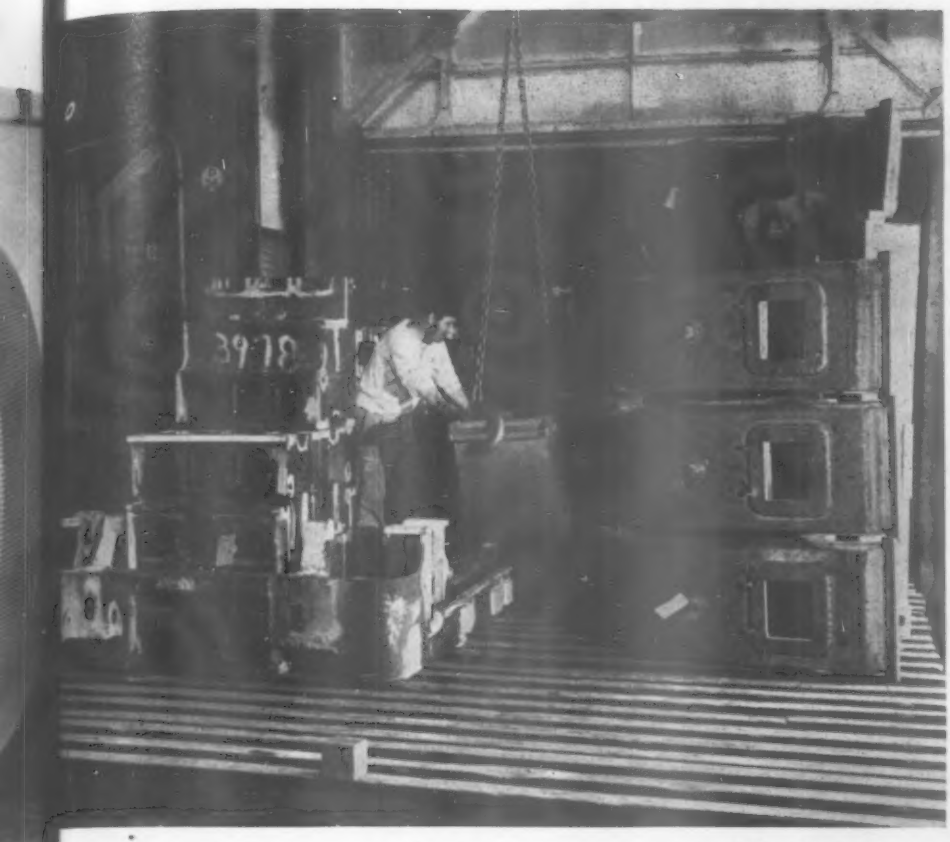


Fig. 6—A furnace such as this one is used to stress relieve weldments

of the inherent difficulty of welding a steel with a carbon content above 0.30% and also because the webs are machined with an interference fit. With this type of fit, the shrinkage due to welding is minimized because the rim is cooling as the gear is being welded, thereby tending to equalize contraction of the weld metal.

Use Automatic Welding

The two inner webs are first assembled and welded, followed by the two outer webs. This assembly procedure is used to facilitate welding. The gear is then placed on a specially designed welding positioner which rotates it under an automatic-welding machine at a 15-deg angle. This procedure is shown for the fabrication of a rotor, Fig. 1. After each revolution of the positioner, the slag from the coated wire is removed so that the suceeding bead will be laid on clean metal. The welds on the insides of these webs are made by hand.

After the rotor has been completely welded, it is stress relieved in a furnace such as the one in Fig. 6 by heating it at a rate of 100 F per hour up to 1200 F ± 25°. The weldment is held at the latter temperature for six hours, and it is then cooled at a rate of 100 F per hour to room temperature.

Reasons for Stress Relieving

Stress relieving not only helps to correct any metallurgical change caused by welding but also removes residual stresses locked up in the structure. Cases have been known where these stresses have reached 30,000 psi, nearly the yield point of low-carbon steel. Should such a structure be loaded in the same direction as the welding stresses, it would have no apparent strength.

Another important reason for stress relieving is to insure there will be no warping or twisting due to locked-up stresses during machining on planers or boring mills, etc. Instances have been known where unannealed welded structures have crept badly out of shape during service periods of as long as two years. The proportional limit of steel is roughly 2,000 psi at a temperature of 1,200 F. If the item is stress relieved properly, residual stresses following stress relieving

Fig. 7—This welded gear blank is 140 in. OD with a face of 37 in.

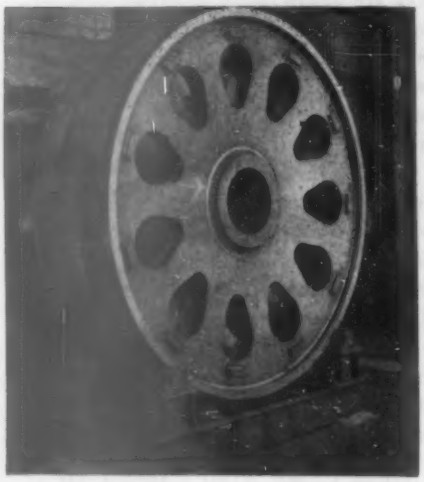
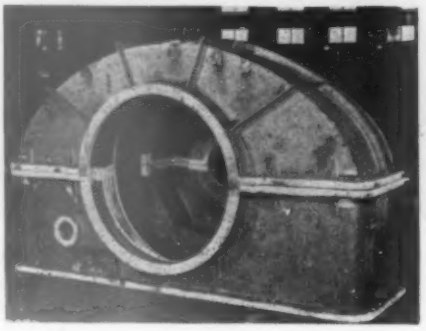


Fig. 8—The gear is assembled while the rim is heated to a temperature of approximately 250 F. Note the ring-type burner near the bottom

Fig. 9—Upper gear case. The cutouts lighten weight, give accessibility for making the internal welds

Fig. 10—Top and bottom halves of welded steel turbine housing



should not exceed this 2,000 psi limit.

After stress relieving, Brinell readings are again taken in order to determine whether or not hardness has been reduced in the furnace. Hardness may be reduced if the gear blank has been heated above the drawn temperature of the forging.

After grit blasting to remove the welding spatter, the gear blank is then ready to have helical herringbone teeth cut in the outer rim. After this operation, it is lapped in oil and ground glass to a tolerance of ± 0.0005 in. for a considerable number of hours in an air-conditioned room. This tolerance must continue for the life of the gear.

Gear Cases Also Fabricated

Gear cases in which gears of this construction are housed are also fabricated of welded steel. An upper gear case is shown in Fig. 9. The transverse members were cut from steel plate. The cutouts shown in the picture give accessibility for internal welding as well as reduce weight. The fore and aft plates that fit under the bearing supports and form the bottom of the arch are formed on a bending brake. Six relatively small steel castings are used for the bearing supports. These, undoubtedly, could be fabricated from steel plate but it would be more costly than to use castings.

Saved 1½ Tons of Steel

After assembly, the case is placed on a specially designed positioner (Fig. 2) that can be turned 360 deg in any direction, thus permitting all welds to be made in the downhand position.

The bottom and top halves of a welded steel turbine housing are pictured in Fig. 10. These pieces were redesigned from steel castings that weighed 16,000 lb into welded construction that weighed 13,000 lb—a saving of 1½ tons. The top half was made in one piece instead of two, thereby eliminating extra machining and bolting. We are told that the machining time on these items was reduced by approximately 20 to 25% because of the lesser amount of stock to be removed. This reduction in time does not include any repair time that might be needed because of porosity or blowholes that would probably appear in a casting of this size. One of the major builders of this type of propulsion equipment states that a weight reduction of approximately 30% has been achieved from the use of properly designed weldments.

Fig. 3 shows a completely welded gear case after all machining and assembling have been completed. The unit is ready to be installed in one of our Navy fighting ships or merchant marine vessels.

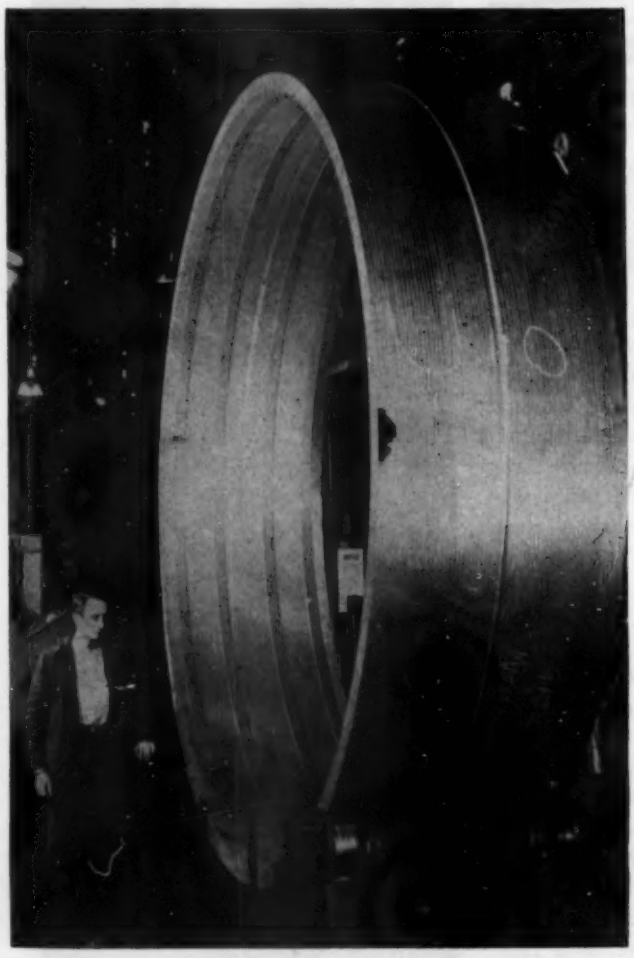


Fig. 11—A special positioner rotates the rim of this big gear blank while its two forgings are being joined by a circumferential weld

Fig. 12—Types of gears (spoke and conical webs) and the radial deflection curves characteristic of them

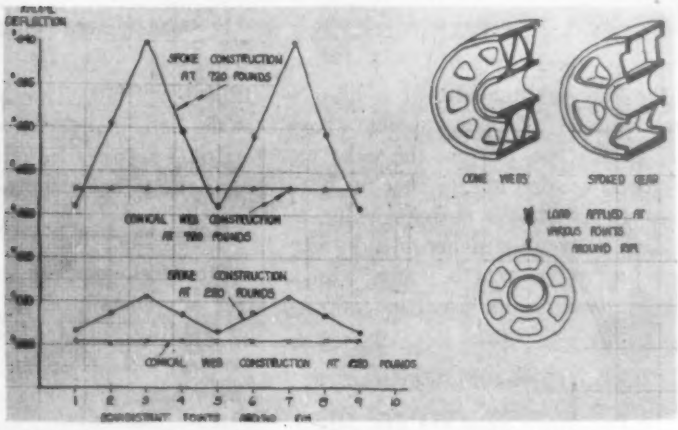
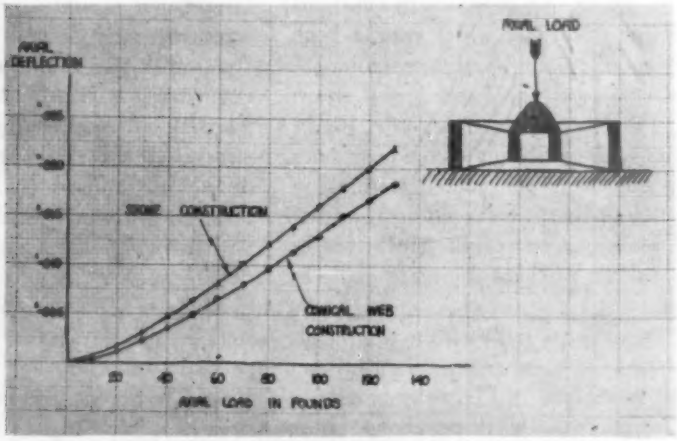


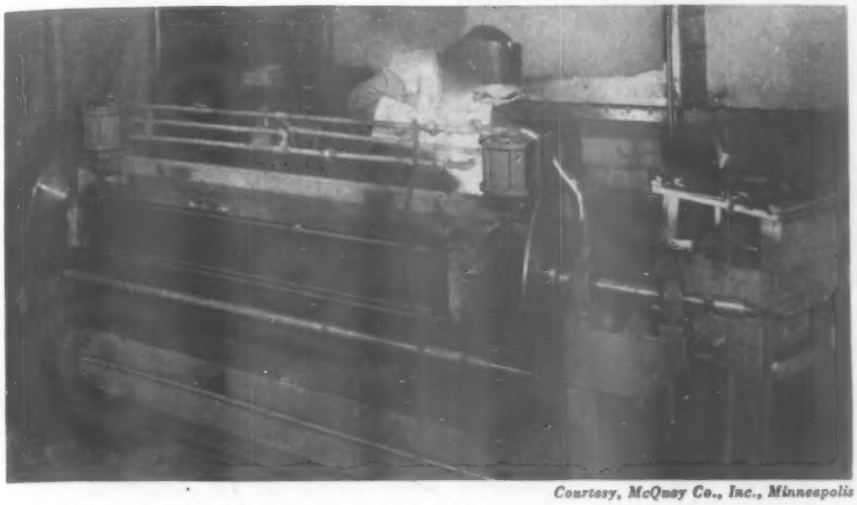
Fig. 13—Elastic deflection characteristics under an axial load. The cone has roughly 78% the deflection of the spoked construction for an equivalent amount of material



A-C Welding Status in 1946

BY ORVILLE T. BARNETT

Production Engineer, Welding Div., Metal & Thermit Corp.



Courtesy, McQuay Co., Inc., Minneapolis

E-6013 and E-6012 electrodes are useful in welding of light-gauge parts

★ Part Two—War-born a-c electrodes help to make it possible to do more than 90% of all metal-arc welding by the a-c process.

Last month the author discussed a-c welding equipment and told of its advantages with regard to freedom from magnetic blow, increased production, lowered power consumption and lesser maintenance. Sketches illustrated five particular applications for which a-c welding is particularly suitable: gapped seams, deep grooves, fillet welds involving corners, deep fillets and the ends of straight runs of horizontal fillet welds. The present and final installment discusses the many electrode types now available to the users of this process.—THE EDITORS

CERTAINLY more than 90% of all metal-arc welding can be accomplished by means of the a-c welding process. This statement reflects a distinct improvement over the situation that existed prior to the war. As might be conjectured, the advancement of a-c welding owes much credit to the Navy and the Army because both services demanded and procured electrode types that had previously been thought well nigh impossible. Top drawer developments were the E-6011 electrode, a new E-6013 variety and a complete line of a-c/d-c stainless-steel electrodes.

Very likely the easiest approach to a review of the many electrodes suitable for a-c welding leads through a grouping of the ferritic and non-ferrous grades. Under ferritic electrodes may be considered mild-steel and low-alloy types, stainless steels and most hard-facing electrodes. Non-ferrous varieties include copper alloys, nickel and nickel alloys and aluminum alloys.

As was mentioned in Part I of this article, a-c transformers were promoted by the WPB to conserve copper and other critical materials. One deterrent to the widespread use of a-c welding in the shipbuilding industry was the absence of a good a-c electrode similar to the E-6010 all-position d-c electrode. Ship subassemblies might be positioned, but the bulk of the welding on the vessels themselves had to be performed in catch-as-catch-can positions. Thus 60% of ship welding was completed with E-6010 electrodes, another 20% with E-6012 electrodes and the remaining 20% with E-6020 electrodes. These percentages cover manual welding only and do not, for the sake of simplicity, include the small percentages of other types used for special applications. Thus the low-alloy molybdenum varieties selected for power boilers and piping as well as the 25-20 stainless-steel electrodes picked for the bulk of the welding on armor plate have been disregarded.

It was well known that high-cellulose coatings of the E-6010 type would not work with a-c. In fact, most leading electrode designers were convinced that high-cellulose contents and good a-c performance constituted a paradox. Yet the Government insisted that the impossible be done. And the ingenuity of the electrode designers gave birth to the true E-6011 electrode type, which contained as much cellulose as the E-6010 electrode besides showing sufficient arc stability for a-c equipment. The E-6011 electrode gave satisfactory physical properties, good X-rays and general performance characteristics that proved to be surprisingly similar to the E-6010 grade. In addition, the E-6011 electrode worked well with d-c reverse polarity. This latter attribute was of distinct advantage to the services as they could equip forward repair depots with E-6011 electrodes without worrying

about the type of welding equipment available.

E-6012 and E-6013 Types

E-6012 electrodes were primarily designed for d-c welding with straight polarity preferred. These high-titania electrodes worked well with a-c, but further refinements were desirable to make the a-c performance equal to the d-c. As a-c welding grew in popularity, the E-6012 electrodes were given improved arc stability. On landing barges and similar craft, the E-6012 electrode made a good record as a workhorse without showing any partiality for type of welding current.

E-6013 electrodes had been created for a-c applications. Therefore the large quantities of sheet-metal products essential to war were easily fabricated with this type. Peacetime applications will continue to require increasing quantities of the E-6013 electrode, which is certainly without a peer as far as ease of joining light-gauge steels is concerned.

In 1941 there was only one E-6013 electrode advertised by any electrode manufacturer. Now several producers of electrodes list two E-6013 products. Fig. 6 demonstrates that only E-6013 electrodes deposit fillet welds with either a convex or a flat profile. The "accepted" E-6013 electrode makes a convex fillet whereas the "unusual" E-6013 electrode gives a flat fillet.

The so-called "unusual" design of coating has received considerable attention because it permits high-speed production of good quality welds. For lap welding, the new E-6013 type leads to a satisfactory bead appearance without breaking down the corner of the top plate as happens with hotter electrodes. New uses of the latest E-6013 electrode promise to take advantage of the remarkable arc stability of the electrode together with weld-metal qualities (especially in the small diameters) that rival the E-6010 and E-6011 groups.

No change has taken place in the E-6020 electrodes. Since the introduction of these "hot rods" approximately fifteen years ago, their a-c and d-c performance have been equally good.

Hydrogen-Free Electrode

Another war baby that will not fit into any existing AWS-ASTM electrode classification is a lime-type ferritic electrode that has shown unusual ability in the welding of high-sulphur (0.25-0.28%S) free-machining steels. The low hydrogen-evolution attributes of the coating minimize the chances of underbead cracking that are encountered in the welding of higher carbon and alloyed steels. While the performance of this electrode is best with d-c reverse polarity, there are case histories of successful application with a-c.

The present situation with mild-steel electrodes puts a-c and d-c processes on an equal footing with regard to electrode choice. A comparable situation exists with reference to the low-alloy or high-tensile electrodes.

The low-alloy electrodes for d-c reverse polarity covering the E-7010, E-8010, E-9010 and E-10010 grades are paralleled by the entire a-c family of E-7011, E-8011, E-9011 and E-10011. Of these, the E-7011 was announced within a year or so of the completion of the E-6011 electrode. Now power plant piping can be welded equally well with either a-c or d-c.

In a similar manner, the E-6012 base formula has been developed through the entire alloy series and has become available for a-c welding. A 1946 announcement discloses a graduated series of physical properties for the E-6013 type of electrode carrying tensile strengths beyond 100,000 psi with well balanced ductilities and exceptionally good X-ray cleanliness. Here, then, are more a-c electrodes to match the new low-alloy, high-strength materials going into the transportation and earth-moving industries.

Cleaning up Pitted Grooves

Silicon-killed steels such as ASTM A-212 and various carbon-molybdenum steels have been chosen for boilers and pressure vessels because of their good strength-weight properties. These two steel types allow weight reduction for power plants aboard ship and require less fabricating labor to weld the thinner shells made possible by the higher yield points and tensile strengths. But the welding of such material necessitated a new E-7020 electrode to supplement the E-7020 varieties available at the outset of the war in order to overcome the defect illustrated in Fig. 7.

Reaction pits were encountered with some alloy steels even prior to the war. But wartime steelmaking conditions increased the frequency with which they were discovered. Very likely some deterioration of parent steel

E-6020 electrodes at very high current densities were employed to fabricate this huge press frame. Note the many corner welds involved

Courtesy, Clearing Machine Co., Chicago

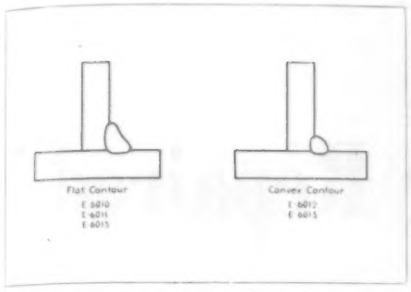


Fig. 6—Fillet contours of different electrodes. E-6013 produces both flat and convex profiles

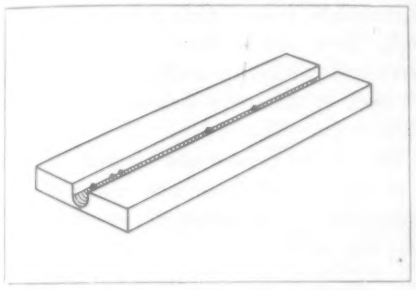


Fig. 7—Side wall reaction pits were encountered in early passes with some E-7020 electrode types

Courtesy, Dayton Fabricated Steel Co., Dayton, O.

Excellent results were obtained in the fabrication of Diesel-engine exhaust manifolds by using E-6020 electrodes, the so-called "hot rods"

and a similar decline in the quality of core wire comprised the explanation. Whatever the cause, welding activities were slowed while the weldor waited for his helper to clean up a pitted groove, and pressure-vessel manufacturers called for help as chipping costs began to mount. The answer proved to be the new E-7020 electrode, which deposited pit-free welds of equal quality with a-c or d-c equipment.

Several more low-alloy steels without a proper place in the AWS filler metal grouping appeared during the war. Special analyses to supply the precise physical properties required for welded aerial bombs, welded shells, armor castings and the like were built around plain and special core wires with coatings suitable for a-c and d-c operation.

Originally, electrode designers were expected to solve the welding problem without concerning themselves with the type of power source. If the chemicals in the coating yielded a d-c reverse polarity electrode, the design was accepted. Or if the coating chemistry proved most responsive to d-c straight polarity, that situation, too, was all right. But such an answer to new coating types is no longer acceptable. If the new electrode will perform with d-c but not with a-c, the designer will very likely be asked to continue his development further.

A-C/D-C Stainless Types

As has been shown in connection with the E-6011 electrode, coating composition puts a high hurdle in the path of electrode development. Nowhere was this statement more truly applicable than in the case of stainless-steel electrodes. Notwithstanding the early difficulties, an a-c/d-c coating can now be supplied for any of the following AISI types: 308, 309, 309 Cb, 310, 310 Cb, 310 Mo, 311, 312, 316, 317, 329, 330, 347, 410, 430, 442, 446, 502. Such an impressive list of stainless types doubtless obscures the many days and weeks and months of discouraging research that preceded the final approval of a-c/d-c electrodes by the services.

Reconversion activities are just getting into stride, but the overwhelming appeal of the a-c/d-c coatings on stainless steels has caused looks of appreciative amazement to appear on the faces of skeptical welding engineers who had concluded long ago that a-c welding and stainless fabrication mixed no better than oil and water.

Hard-Facing and Tool-Steel Electrodes

Hard-facing applications are being performed in increasing tonnages with a-c equipment. Well over half of the hard-facing jobs encountered can be handled with a-c welders, and the number is growing almost daily. Nor is hard-facing restricted exclusively to the ferrous types; austenitic steels, including austenitic manganese, may likewise be welded with a-c. Inexpensive a-c electrodes, really a-c/d-c formulations, have allowed machinery manufacturers to hard-face vital points subject to abrasive wear. The increase in manufacturing costs is quite insignificant, and the increased wear resistance improves sales appeal and paves the way for repeat orders.

Somewhat akin to hard-facing electrodes are the tool-steel analyses, not all of which will respond to a-c welding. However, this specialized field does not represent a very substantial tonnage as yet, and there are rumors of a-c developments not far from completion.

Copper, Nickel and Aluminum

Unfortunately, a-c electrode develop-

(Continued on page 62)

★ MAINTENANCE

Cast-Iron Gear Repaired by T

Photos courtesy Metal & Thermit Co

Fig. 1—The broken spur gear. Originally, there was only one break in each section, but one of the broken pieces had to be cut apart and rewelded

Fig. 2 (below)—A template shaped to fit the gear teeth was used to align the broken pieces. Allowance had to be made for expansion and contraction

TWO PIECES were broken from a large cast-iron spur gear in service at the Stamford Rolling Mills Co., Springdale, Conn. This gear had originally been cast in two sections, which were bolted together as shown in Fig. 1. Neither section was spared when the catastrophe occurred.

One of the breaks was located where a previous break had been repaired by arc welding. This may be seen by inspection of the section to the left in Fig. 1. The new job was of such magnitude that it was decided to effect the fresh repairs by means of thermit welding.

TEMPLATE FOR ALIGNMENT

The careful alignment of the broken sections was extremely important to the success of the job. A specially prepared template (see Fig. 2) was used. After the broken pieces had been properly aligned and clamped in place, a gap was cut (Fig. 3) to allow sufficient width for the pattern and to assure clean, properly spaced surfaces for welding. Particular care was taken to allow for expansion and contraction in order to minimize misalignment in the finished job.

In making each of the three welds required, the standard thermit-welding procedure was followed. A wax pattern was made in the size and shape of each joint. A steel mold box was then set up around the joint, and molding sand was carefully rammed about the wax pattern. As in any thermit-welding operation, it was important to see that the molding material was well rammed underneath the pattern and was hard and firm at all points where it came into contact with the wax and subsequently with the molten steel. After gates and risers had been provided, the mold box was preheated for several hours to melt the wax pattern and bring the parts to proper welding temperature. The thermit was placed and ignited by means of a charge of ignition powder. The tapping of the molten

Thermit Welding

Thermit welding is becoming increasingly popular in maintenance for the salvage of heavy equipment. This broken spur gear is a good example.

BY CLYDE B. CLASON

metal into the mold is shown in Fig. 4.

Two Breaks, Three Welds

One of the broken pieces was not only cracked but also somewhat twisted, so it was necessary to cut it apart and weld the two parts back together before this piece could be joined to the main section of the spur gear.

Fig. 4—The reaction in the crucible is completed, and the molten metal is being tapped into the mold

Eighty-eight pounds of forging thermit were used to make this weld.

Use 288 Lb. of Thermit

The second weld was made to join the large portion to the section at the right of Fig. 1. Eighty-five pounds of thermit were needed. The part that consisted of the two small pieces previously joined was then welded to the main section of the gear, using 115 lb of thermit. Altogether, the three welds required approximately 90 hours of working time and 288 lb of forging thermit. How the completed welds looked is shown in Fig. 5.

The welded gear was returned to service in fully as sound condition as a new casting. Despite the large amount of thermit material and labor utilized for this heavy-duty repair job, the salvage was effected at a fraction of the cost of a new spur gear and a fraction of the time that would have been needed for replacement.

Fig. 3—After alignment had been secured, a gap was cut to allow sufficient width for the wax pattern

Fig. 5 (below)—The three finished welds. The gear was returned to service fully as sound as a new casting

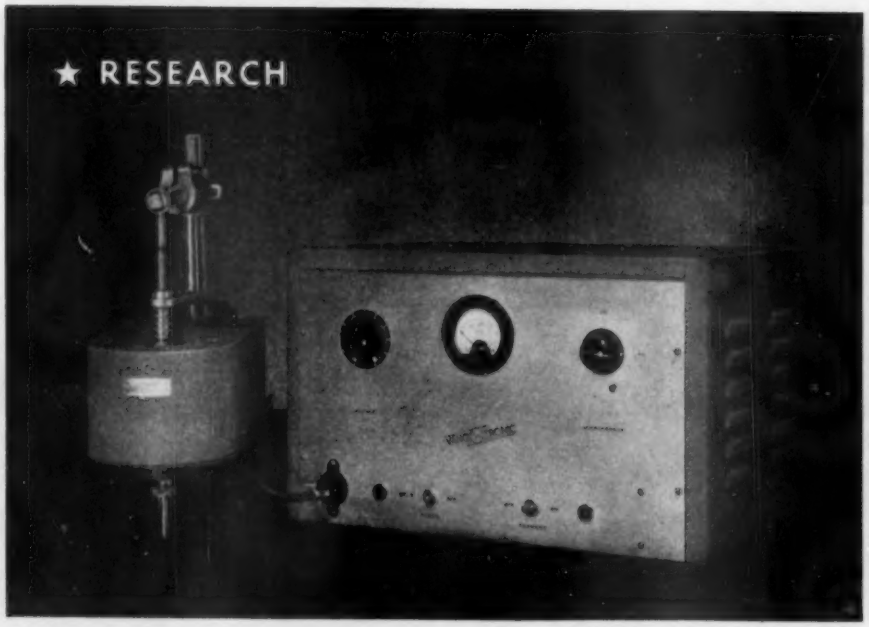


Fig. 1—This electronically controlled bench welder makes use of the air-core transformer principle to speed stored-energy welding

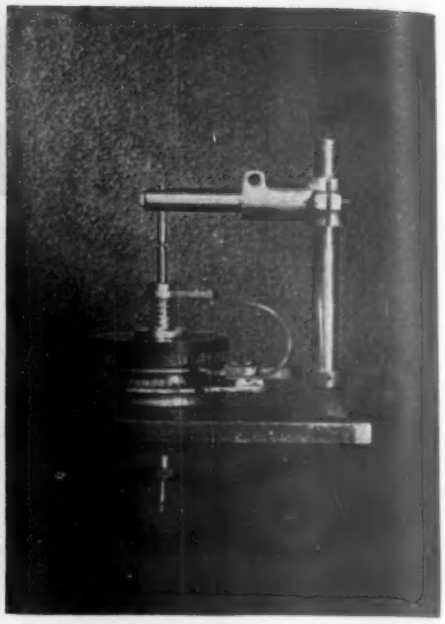


Fig. 2—Transformer and armature applied to spot-welding electrodes

Air-Core Transformer Spot Welder

BY C. H. STRANGE

Chief Development Engineer, Stevenson, Jordan & Harrison, Inc., New York City.

The speed of stored-energy welding is restricted by the relatively long periods needed for current decay . . . caused, to a large extent, by residual magnetism in the transformer core. Both of these difficulties are now overcome, claim designers of a new type of transformer.

A STORED-ENERGY spot welder embodying some novel applications of electrical principles has been developed in the laboratory of Stevenson, Jordan & Harrison, Inc., New York City, and is now being marketed by the Vangtronic Co., Bridgeport, Conn. To explain the advantages of this newly developed spot welder, it is first necessary to review the characteristics of stored-energy welding in general.

Importance of Wave Form

Stored-energy welding offers a practical and reliable means of providing large values of welding current precisely regulated in amount and form as required by the types of materials to be welded. The word "form" may necessitate further explanation. The shape and hence the heating cycle of an ordinary 60-cycle a-c wave is fixed, while the stored energy can be discharged in different wave forms so that any desired rate of heat input can be obtained.

The stored-energy welder does not require such a large power supply and such large feeder lines as the customary a-c welder, and it may often be operated in a small plant far from a power substation. The higher first cost of the stored-energy equipment is thus offset by the lower cost of power feeder lines and lower demand penalty charges by the power company.

Although between ¼ and 1 second is needed to store energy for each weld, the number of welds per minute thus made possible is large enough for most spot-welding applications. Welders using stored energy are not affected by voltage changes in the a-c supply, since the controls are set to store the same amount of energy no matter whether the supply voltage is low or high.

Limitations of Current Decay

In the customary stored-energy welding system, the long period required for the decay of the current restricts the speed with which successive welding operations may be made. If the welding electrodes are separated from the work while current is still flowing

through the weld, sparking and sputtering of the electrodes may occur, harming both work and electrodes. Some types of stored-energy systems install a control to short circuit the primary of the welding transformer after each weld so that the electrical energy left in the transformer can be dissipated. However, a small amount of magnetism still remains in the transformer, and this will affect the next welds. To prevent trouble from the residual magnetism, some capacitor-discharge systems are arranged to remove it between welds by passing a small current through the transformer winding in the reverse direction.

These two difficulties—the relatively long period of decay of the current and the residual magnetism in the welding transformer—are closely related. Both are caused by the iron which forms the core of the transformer. In the usual type of welding transformer, it is customary to have a large amount of iron to avoid saturation by the heavy current discharge of the capacitors.

In the type of stored-energy spot welder I am describing, the transformer is of the air-core type, constructed like a solenoid. The only iron used is an armature within the solenoid for producing a follow-up forging pressure, which will be described later.

Can Discharge in 1/500 Second

As this welding transformer has so little iron in its construction, a current wave of unusually short time and high frequency can pass through the primary. Since the transformer has a low impedance, the current is oscillatory from the capacitor discharge and the circuit is resonant. The short time of welding current discharge and higher alternating frequency possible is indicated by the oscillogram, Fig. 4, which represents a weld current discharge in approximately 1/500 second.

The very brief but very intense electric discharge generates heat at the contacting surfaces so quickly that the weld can be completed before an appreciable amount of the welding heat has had time to dissipate into the surrounding material. By thus confining the welding heat almost entirely to the actual faying surfaces, which are not readily accessible to the air, corrosion of the material is minimized. There is also an improvement in energy utilization since the energy consumed is restricted very nearly to the actual juncture of the material. This means that welds can be made with less stored energy than is usually required.

Used for Dissimilar Materials

The joining of dissimilar materials is accomplished more readily because of the sharp gradient of temperature in the material adjacent to the weld. The time required for the current discharge to melt or vaporize the surfaces to be joined is so short that even the best thermal conductors do not have time to conduct the welding heat into the main body of the metal. This system of welding, utilizing a two-pool mercury tube, has been patented by A. Vang.

In order to shorten the current build-up interval to a small fraction, it is necessary to reduce substantially the inductance of the circuit and to utilize the principle of resonance at a frequency of several hundred cycles per second. The air-core transformer was developed to meet this requirement. Fig. 5 shows such a transformer. It consists of 216 turns of primary, wound in three 72-turn, pancakelike coils, and two turns of secondary, the latter being merely thick, horseshoe-shaped copper plates connected in series. The application of this transformer to spot welding is shown in Fig. 2.

New Electronic Tube Invented

In such a resonant circuit, the electronic switch must conduct in both directions, a feat impossible to a single ignitron or thyratron. This necessity resulted in the development of a double-ended symmetric tube, also patented by A. Vang. This tube has no polarity characteristics once it is ionized, provided the reverse current follows along quickly enough to prevent deionization from occuring. The tube is started by the application of an ionizing voltage—obtained by a spark coil or ignition coil of some type—to an external electrode near the surface of the mercury pool.

The three major variables in resistance welding are amount of welding current, duration of current and pressure. The latter may be conveniently divided into the initial pressure for holding the work in place between the electrodes and establishing the resistance contact and the follow-up or forging pressure. The forging pressure is of prime importance and constitutes the main pressure variable in resistance welding.

In the usual spot or seam welder, the mass and relatively high inertia of

Fig. 3—The welder in operation at the Foxboro Co., Foxboro, Mass., well-known manufacturer of industrial recorder-controllers

Fig. 4—Oscillogram of weld current discharge in 1/500th of a second

Fig. 5—Air-core spot-welding transformer with armature (right)

the welding head and electrode assembly may delay the follow-through movement made to produce a good weld. The failure to secure a precisely timed follow-through movement may even result in flashing between the electrodes or a blowing out of the weld metal.

Function of Acceleration

Neglecting friction, the time required for the restoration of the mechanical pressure after any sudden reduction in weld section is a function of the distance to be traveled, the mass of the moving system and the forces available for acceleration. The fundamental formula expressing the relationship between the acceleration, *a*, of a mass, M, by an applied force, F, is

$$a = \frac{F}{M}$$

where the force is expressed in pounds, and the mass in pounds divided by the gravitational constant, *g*, or 32.2 ft per second per second. For example, assume a movable spot-welder electrode assembly weighing 80 lb. Neglecting frictional forces, the acceleration of this system with an applied force of 800 lb will be

$$a = \frac{800}{80/32.2} = 322 \text{ ft per sec per sec}$$

This formula indicates that it is desirable to reduce the mass of the moving members to a minimum, thereby providing more rapid acceleration of the electrode assembly. The current weld period during welding should also be properly synchronized with the pressure cycle.

In resistance-welding machines, the sources of pressure fall into three general groups: spring, air and hydraulic. (Manually operated machines are limited to relatively low pressures due to the factor of operator fatigue.) This newly developed stored-energy welder resembles others in that the initial pressure is provided by adjustable spring compression. It differs materially, however, in the follow-through or forging pressure, which is produced by magnetic pressure initiated by the welding current.

Armature-Solenoid Combination

Referring to Fig. 5, an armature of suitable iron material is so situated within the transformer that the same inductive lines of force that cut the secondary to produce the welding current will also draw the armature into the solenoid. The effect of this is to put upon the lower electrode a pressure which is relative to the amount of current and is also relative to the wave form of the welding current. Due to hysteresis lag in the iron, the pressure produced upon the electrode and hence the material being welded is automatically synchronized with the welding heat. The force of this magnetic forging pressure can also be regulated by changing the position of the armature in relation to the neutral magnetic centerline of the solenoid transformer. This is accomplished in this welder by means of a knurled thumb screw (see armature at the right of Fig. 5) which raises or lowers the armature within the solenoid.

The combined mass of the armature and lower electrode is small, and the mass of the moving members in the equation previously given is thus reduced to a minimum, resulting in more rapid acceleration and a better follow-through movement. The magnetic-pressure feature of the new welder is now patent pending.

Counter Magnetic Force

When large current flows are present in a secondary, the magnetic stressing of the members of the secondary circuit must be given consideration. This magnetic stress tends to force open the electrodes. In a welder secondary loop, the magnetic field may be so intense that the conductors tend to repel each other. The magnetic field set up by the current in the parallel electrode-holding arms tends to separate them with a force that is by no means negligible. The effective pressure on the work, therefore, is the force applied to the electrodes minus the counter force imposed by the magnetic stressing of the secondary current. The new type of welder avoids the difficulty by an arrangement in which there are no parallel current conducting arms. The welding transformer and lower electrode are so positioned that the induced fields are at right angles to the arm carrying the welding current to the upper electrode. There can be, therefore, no appreciable magnetic stress tending to force open the electrodes.

The welder circuit in the small bench welder type includes the power transformer, a thyratron tube for half-wave rectification and a variable resistor (potentiometer) in the bleeder resistance line across the capacitors. This potentiometer regulates the amount of voltage imposed upon the grid of the thyratron, thus determining the shut-off voltage and amount of charge desired on the two capacitors. When the capacitors are charged to the predetermined voltage, they are then discharged through the new two-mercury-pool tube and into the welding transformer primary. The tube is ionized by discharging a small capacitor through a spark coil.

References

The Resistance Welding Manual—Resistance Welder Manufacturers' Association, Philadelphia

Electronic Control of Resistance Welding—G. M. Chute, published by McGraw-Hill Book Co., Inc., New York City

★ MAINTENANCE

A New Way to Weld White Metal

A refractory oxide coating has made white-metal castings difficult to weld. The difficulty has been overcome by a bit of welding jiu-jitsu that makes use of the oxide's hitherto objectionable properties.

BY J. S. WRIGHT

A RECENT development in oxy-acetylene welding technique has made it possible to repair white-metal die castings in either the vertical or overhead positions. White-metal castings fall into three general classifications according to the basic composition; *e. g.*, zinc, aluminum and magnesium. The type of alloy must be identified before welding is attempted since different rods and fluxes are required. Zinc-alloy die castings are made in much higher tonnage than aluminum or magnesium (approximately 75% of the total castings) and hence are more likely to be encountered. The majority of the zinc-alloy die castings are made of an alloy having an average melting point of 725 F.

Coating Chief Problem

The chief obstacle to the proper welding of white-metal parts has been the heavy, hard oxide coating that covers the outer surface of the metal. This hard oxide coating melts at a temperature much higher than the white-metal itself, and no simple chemical flux can be found to dissolve it as in the welding of aluminum. As a result, the surface coating remains hard and solid long after the metal beneath it has become molten and fluid. Fig. 1 illustrates this problem.

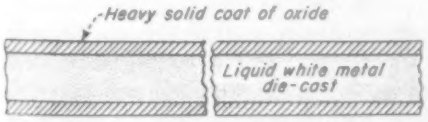


Fig. 1 — The problem: The white metal liquefies before the coating

The newly developed technique makes use of this peculiar property to facilitate the welding of white-metal castings in the flat, vertical and overhead positions.

Downhand Technique

Generally in welding white-metal, a small-size tip is used with a flame maintained with excess acetylene.*

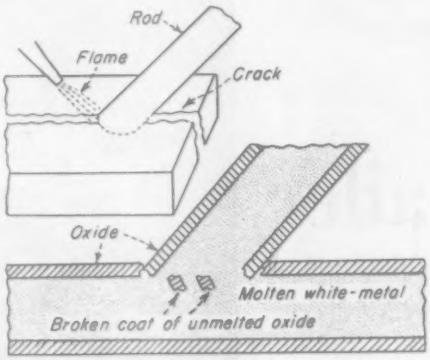


Fig. 2—Solution: The heavy oxide coating will crack as the rod scrapes it if the part is ready to weld

White metal oxidizes so easily that a neutral flame will burn it. The white-metal welding rod is also heated, and the work and the welding rod are brought to a melting point together. It is important to use a rod that flows smoothly at the right temperature.

Test for Temperature

Occasionally, the base metal is tested by scraping it with the welding rod. When the part is ready to weld, the oxide coating will crack as the rod scrapes it. The rod, which has also reached its melting point, quickly scratches across the lips of the break. As the oxide coating breaks, the molten white metal quickly flows into the base metal (see Fig. 2).

The same technique is also used for vertical and overhead welding (Fig. 3).

Holds Metal in Place

Pure white metal, when molten, flows quickly like water. However, this flow is restricted and directed by the tenacious oxide coating that forms almost instantaneously over the molten surface. The oxide coating, when forming from the pure white metal, is elastic long enough to keep the molten metal in place while the weldor is working his welding rod into the break.

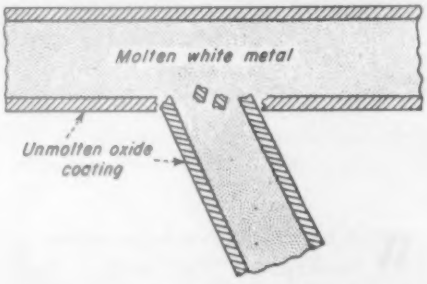
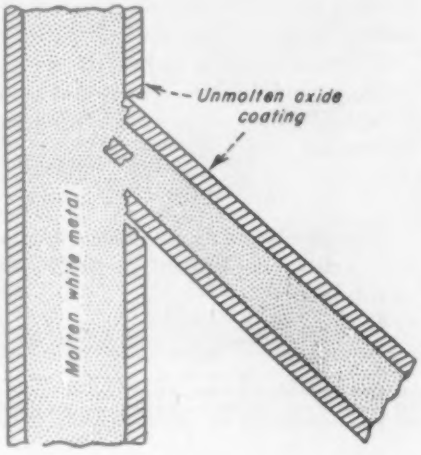


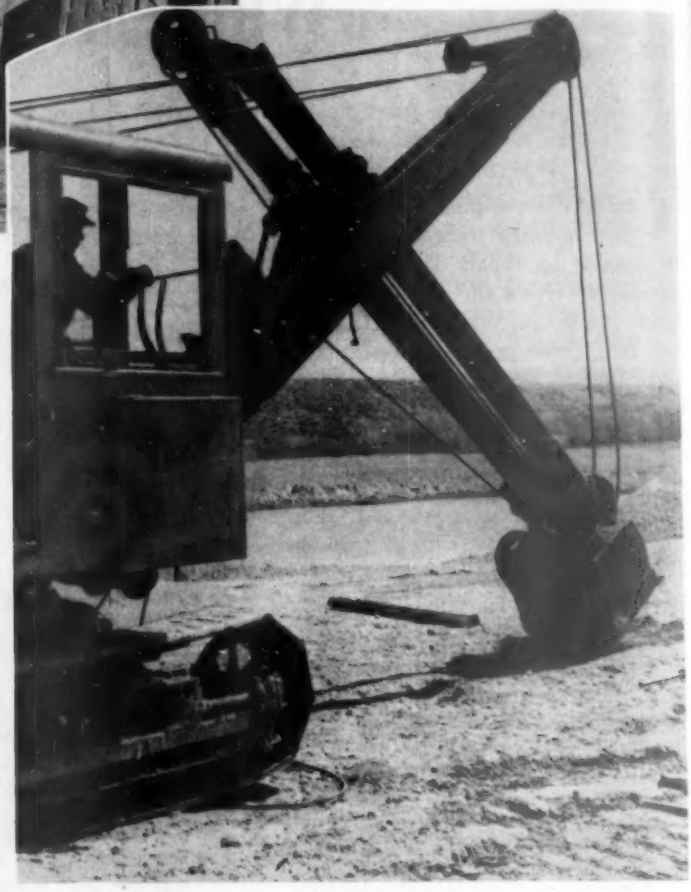
Fig. 3—The same technique is used for overhead and vertical welding



* The torch flame is about 5,800 F when neutral, and somewhat lower when adjusted with excess acetylene. It is important to select a very small tip, not larger than a 72 drill size.

Fig. 2 (left)—The I-beams for the frame were split with a torch, bent and then welded back together. Mr. Linton is pointing to the brace and extra plate welded at the bend

Fig. 3 (below)—A dragline and shovel combination with two booms is moved with the new trailer. All preformed cable is used (see text)



★ CONSTRUCTION

We Made Our Own Trailer

BY DON LINTON*

WE HAD to have a large trailer for hauling our "cat" and combination dragline and shovel. Also we were building a portable screening plant, and we had no equipment capable of moving this from one location to another. We tried to buy either a new or used trailer but with no luck. However, we were promised the wheels and tires —twelve of them—if we could produce the trailer.

We Built It

This set-up left us with two alternatives—either do without or build our own trailer.

We built it.

Welding and flame-cutting made it possible for a road contracting firm to build a 30-ft trailer for hauling heavy earth-moving equipment.

Not including the rubber, the cost ran slightly over $2,500. The job when completed had a 15-ft bed with a 30-ft overall length. The I-beams from which the frame was constructed are 23 ft, 9 in. long and 16 ft, 6 in. from the "gooseneck" back (see Fig. 1).

Bending the I-beams at the end of the trailer proved to be our toughest problem. We finally worked it out by cut-and-try methods, but not before we had run up considerable unnecessary time and expense in experimenting.

Split Beams With Torch

Fig. 2 shows details of the procedure which finally worked for us. We split the I-beam with a cutting torch and bent first the lower half and then the top half. When the bending was done and trued, we welded the two halves back together. We then braced the finished job on the bend and added an extra plate to insure the required strength.

The finished 12-wheeled job is giving us satisfactory service in hauling our dragline (Fig. 3). We have built in

* Mr. Linton is a partner in the road and excavating firm of Patton and Linton, Pocatello, Idaho. He has charge of the machine and repair shop, sand plant and all equipment.

our own shop a second boom for the dragline and now use it as a ⅝ yard shovel as well as a ¾ yard dragline. This switch can be made in a few hours and enables us to do a great deal more work with the one machine. The trailer is also used to haul a T-18 Diesel bulldozer (Fig. 4). We are planning on building a second and larger trailer this fall.

Wire Rope Kinks

The war taught us a great many useful kinks regarding service, rebuilding and maintenance. For example, we now get two to three times the life from wire ropes that we did in the prewar era. One reason is our switching to all preformed rope. Without additional service, we get from 40 to 60% more safe life from the preformed. By giving ropes regular inspections and cleaning them and applying new lubricants every ten days to two weeks, we find that we have very few rope breaks and get better operation results from our equipment.

Cables which show bad wear on one end can be fixed by switching ends, placing the worn end on the drum. Sometimes we back the worn section, allowing a wrap on the drum for this. We use around 6,000 feet of wire cable on our equipment, and at the sand plant we have been able to cut our rope cost in half in the last two years, a considerable operation savings.

Build Screening Plant, Too

When we were unable to purchase a portable screening plant, we followed the same reasoning which built our trailer. We combed the scrap pile and visited a neighboring used equipment dealer in search of scrap metal and old parts. Our new screening plant (Fig. 5) has a crusher with 8 to 36 inch jaws and will deliver around 300 tons of sand and gravel a day. It, too, can be transported on our new welded trailer.

Our war and postwar maintenance and operation have required a lot of makeshift juggling, but we have been able to operate every day. Our program is now set for greatly increased production and work for at least a year and a half without purchasing new equipment. We are finding that "WE CAN DO IT IN OUR OWN SHOP" is a very good slogan.

Fig. 1—The 30-ft trailer with 15-ft bed which was built in Mr. Linton's machine and repair shop. The "gooseneck" back offered a difficult problem

Fig. 4—This Diesel bulldozer is also hauled on the trailer. It is being used in this picture to trap aggregate for the portable screening plant

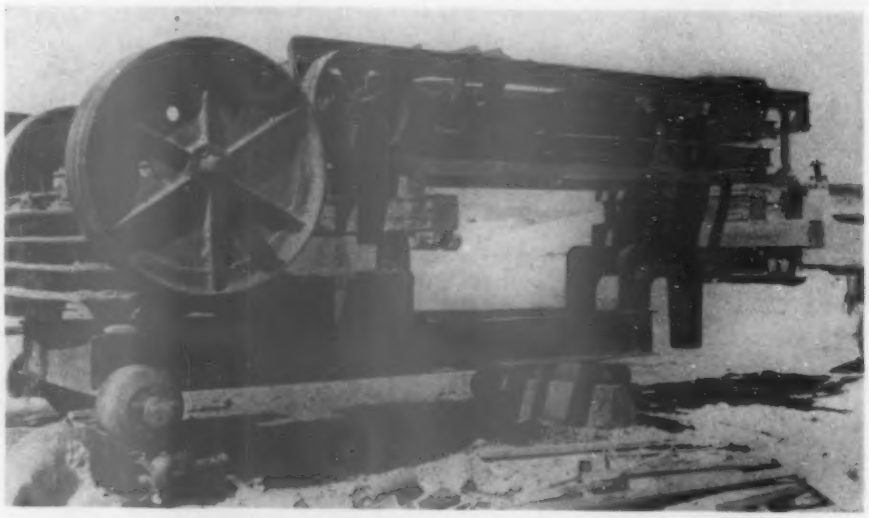


Fig. 5—Small portable screening plant built from scrap metal and old parts. It, too, can be moved on the trailer from location to location

★ PRODUCTION

Ingalls' Welded Diesel Locomotive

BY ROBERT H. MACY

Chief, Locomotive Division, The Ingalls Shipbuilding Corp., Pascagoula, Miss.

THE Ingalls Shipbuilding Corp., Locomotive Division, has just completed at its Pascagoula plant its first 1,500-hp Diesel-electric locomotive. This welded product was taken on a demonstration tour of southern railroads and exhibited to thousands of railroad men and interested spectators. While being demonstrated at Birmingham, it was used to pull revenue loads, hauling 7,719 tons in 93 ore cars at speeds up to 50 mph.

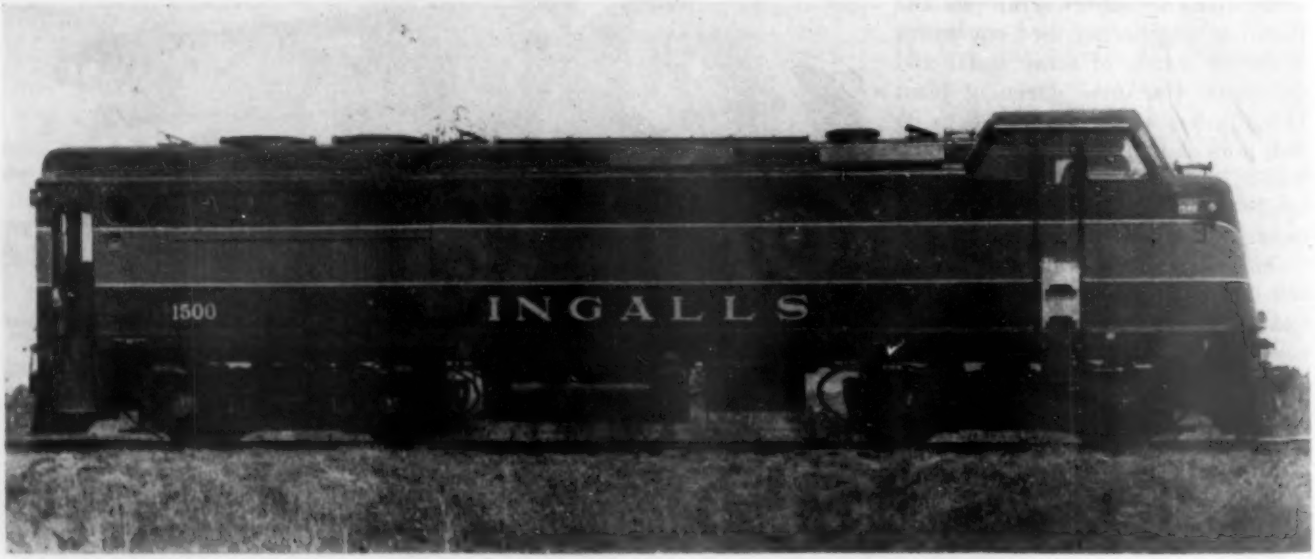
MARKET FIRST SURVEYED

Locomotive manufacture, a new industry for the southern half of the United States, was chosen by Ingalls after conducting a survey to find a steady outlet for its manufacturing facilities. There were three main requirements to fulfill: (1) a product that was adaptable to the company's present facilities, (2) a product that would use the skills of Ingalls' trained personnel and (3) a product with a steady mar-

General Characteristics

Length inside knuckles	**59 ft 1 in.**
Length over body	**56 ft 6 in.**
Width, extreme	**10 ft 6½ in.**
Height, extreme	**15 ft 0 in.**
Weight, fully loaded	**240,000 lb**
Weight, light	**225,000 lb**
Fuel oil capacity	**1,000 gal**
Lubricating oil capacity	**157 gal**
Cooling water capacity	**480 gal**
Sand capacity	**27 cu ft**
Maximum speed with worn wheels	**65 mph**
Gear ratio	**15/63**
Starting tractive effort, 30% adhesion	**72,000 lb**
Continuous tractive effort	**42,800 lb**
Speed at continuous tractive effort	**10.5 mph**
Minimum curve, radius (locomotive alone)	**150 ft 0 in.**
Wheel diameter	**42 in.**

Fig. 1—The new Ingalls 1,500-hp Diesel-electric locomotive incorporates many special features of welded design



The first locomotive to be built by a southern shipbuilder marks the beginning of a brand-new industry for the South.

ket. With regard to the third requirement, it is estimated that it will take the locomotive industry 13 years to catch up with just the domestic demand.

After the company had decided to build locomotives, a second extensive survey was conducted among the railroads themselves to learn what new features were needed. As a result of this survey, the Ingalls-designed locomotives will be built to railroad men's own specifications. It is planned to turn out several hundred of them a year when full production is attained.

Suitable for Any Service

The new locomotive (Fig. 1) is an all-purpose type suitable for heavy switching or transfer service or for freight and passenger road service, either singly or in multiples of two, three or four units. This adaptability is made possible by the turret-type of cab construction which permits 360-degree vision. The locomotive is equipped with a pilot at both ends. It is thus suitable for switching or for certain types of road and suburban service where it is not always feasible to turn a locomotive around. It is also equipped with the necessary jumper and air connections for multiple operation.

Welded Body and Underframe

Both the underframe and body are of all-welded steel construction. The underframe (Fig. 2) is of particularly rugged design. The center sills are 14-in. H-beams with a heavy plate welded across the top and bottom of each sill to make it, in effect, a box girder. The body (Fig. 3) is fabricated by welding 11-gauge and 14-gauge (⅛ and 5/64 in.) sheet steel. There is a portable hatch in the roof for access to the engine, and the entire roof over the engine may be taken off in the event the engine is to be removed. The trucks are of the swing bolster type, each having eight triple coil springs, two quadruple full elliptic springs and 42-in. wheels with clasp brakes. Trucks have two axles each, and the traction motors are geared to each axle. Journals are 7 by 14 in. and are equipped with roller bearings.

Fig. 2—The underframe and cab floor are of welded steel construction

Fig. 3—The cab is fabricated by welding 11-gauge and 14-gauge sheet steel

The 1,650-hp Diesel engine is a four-cycle, turbo-charged type operating at 660 rpm. The engine delivers 1,650 hp, and 1,500 net horsepower is available at the generator for traction purposes after the auxiliary load for driving the fans and other equipment has been deducted.

The Diesel engine is of the 8-cylinder in-line type, having a bore of 12½ in. and a stroke of 15 in. The engine bed,

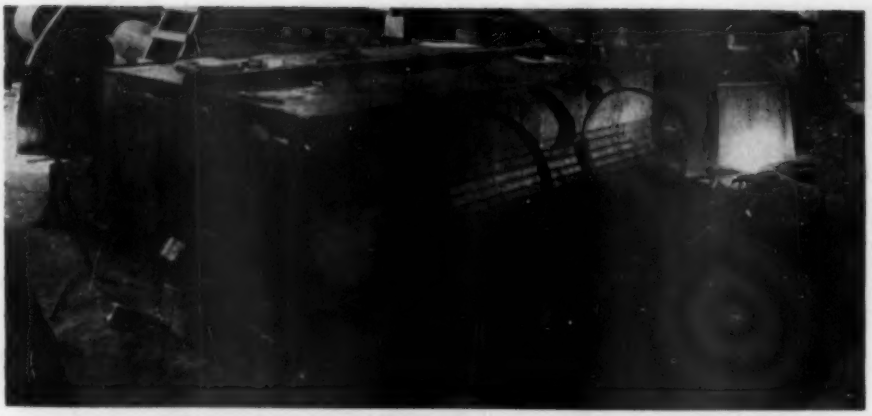


Fig. 4—Leakproof welded seams are necessary on the 1,000-gal fuel tank

block and cylinder heads are steel castings to gain greater strength and reliability. The engine bed is extended to provide a rigid support for the generator. The engine uses a dry cylinder block with individually cooled cast-iron liners. The dual intake and exhaust valves are of heat-resisting steel with seat inserts and are interchangeable. The engine has a cast-iron oil cooling system and a forged one-piece crankshaft. A welded water-cooled manifold of the "Helixhaust"* type is used to insure the most efficient exchange of heat.

Fuel and Cooling Systems

The 1,000 gal fuel tank (Fig. 4) is fabricated by welding steel plate. Individual fuel injection pumps are actuated by a chain-driven engine crankshaft, while the fuel supply pump is driven by an electric motor. Circulating water and lubricating oil pumps are built into the engine. A hydraulic variable-speed governor is used in association with auto-load control. The usual alarms are provided for the lubricating oil and water cooling systems, and in addition a bearing "watchdog" system is installed which will shut off the engine in the event of excess wear or failure of bearings. A turbocharger is attached to the engine through a filter. At the end of the engine opposite the generators is a flexible coupling for driving an air compressor.

Straight fin-tube radiators are used in each side of the locomotive. Each radiator is built in two entirely separate sections so that in the event of the failure of one section the locomotive will still have three-quarters of its cooling capacity left. The radiators are generously proportioned so that the locomotive can continue to operate at full power in the event of such difficulty. The cooling air passes through the radiators into an air duct and through two electric motor-driven cooling fans located in the roof. The cooling fans are driven by variable-speed motors associated with automatic shutter control, making it possible to obtain very close regulation of water temperatures. After the water is cooled in the radiator system, it passes through an oil cooler of the shell and tube type to cool the lubricating oil before it (the water) returns to the engine. A large duplex oil strainer and a four element waste-packed filter are provided for cleaning of the lubricating oil.

Space for the installation of a steam generator is provided adjacent to the radiators, and a portable hatch is arranged for their easy removal. A 480-gal water tank is built into the locomotive. A vestibule at the rear provides a shelter for switching crews operating in transfer service to obviate their riding in the cab.

Motors and Generators

There are actually four generators: the main generator, the fan generator, exciter and auxiliary generator. The main generator is attached directly to the engine crank shaft and is mounted on an extension of the engine bed plate. It is rated 750 volts maximum with a continuous rating of 1,760 amp at 660 rpm. The fan generator is attached to an extension of the main generator shaft, and the exciter and auxiliary generators are driven by vee-belts from a sheave on the end of the fan generator.

The traction motors have a gear ratio of 15:63 and are cooled by electric motor-driven traction motor blowers. These blowers discharge air through flexible connections to the top of the traction motors. Their use makes it possible to maintain motor cooling at an efficient level even when the Diesel engine is idling. The blowers take cool air from outside and force it through a filter of the screen-and-baffle type, assuring clean, cool, dry air for the traction motors. This system has a marked effect on the capacity of the locomotive.

The exciter is of the differential series field type and is both separately and self excited to provide the desired engine-loading characteristics. It is supplemented by the auto-load system of load control, which reduces the generator power demand on the engine if the latter is unable to develop its normal output for any reason. This control prevents overloading and results in better performance and reduced engine maintenance.

The traction motors are connected in series-parallel only, thus eliminating the apparatus required for transitions to other connections. In addition to the saving in switches and relays, the simplified connections improve operation by the steady application of power during acceleration. At higher speeds there are two stages of field shunting.

This locomotive uses no conduit and avoids the customary difficulties due to condensation and grounding. All cable used is of the lead and bronze armored type with varnished cambric insulation. This type of cable has been extremely successful in marine installations for many years. It resists heat, cold, moisture, oil and mechanical injury. Its use in railway service is expected to result in longer life and less maintenance expense than the conventional conduit system of wiring. Instead of the usual connectors and tubes or tape, connections to traction motor leads are made in watertight junction boxes. Free use of junction boxes and terminal strips is also made for electrical connections throughout the locomotive.

Will Continue Shipbuilding

In addition to its new venture with land transport, the Ingalls yard will continue to build passenger and cargo vessels. At present the yard (the largest single industrial installation in Mississippi) is busy on more than $100,000,000 worth of ship contracts and employs about 7,000 persons.

* See "Welded Diesel Manifold," The Welding Engineer, August, 1944 (page 27).

★ PRODUCTION

Welding His Way to Success

BY E. D. ANDERSON*

Starting out with one small welder, C. S. Paterson, of Kansas City, Mo., now has a profitable business as a manufacturer of welded products.

MANY individuals, including returning veterans, have seen the broad possibilities offered in the field of arc welding as a means for establishing their own businesses. This is not surprising in view of the fact that welding, despite its remarkable growth, is still in its infancy as an industry and offers exceptional opportunities to the man who possesses the grit and determination to start on a small scale and stick with it.

Financing Can Be Detoured

The problem of financing is usually the first thing that comes up when a man starts his own business. C. S. Paterson, proprietor and sole owner of Pat's Welding Shop, 607 Grand Ave., Kansas City, Mo., found that this problem was not an insurmountable obstacle. Paterson just went ahead, one step at a time.

His capital was limited, but he had enough to buy a small welding machine. The jobs that were brought into his place of business consisted of everything from cook stove parts to the family washing machine and the broken auto bumper. No part was too small, and he cheerfully welcomed anything that came in to be repaired.

Trained Weldors for War

When the war broke out, welding operators were needed badly. In addition to his regular repair business, Paterson helped to relieve the manpower shortage by training weldors for shipbuilding and other wartime jobs. He managed to keep busy, but his energies were far from exhausted.

From repair work, he has graduated into manufacturing on a small scale. This does not mean that he will no longer take care of any repair work that comes along—it's just another addition. His manufacturing work keeps the place busy and helps take up the slack periods.

Paterson generally turns over the forming and shearing of plate to shops having equipment suitable for this, but all welding and assembling is done at his own shop. At the present time he has four arc weldors.

Weld Dippers and Funnels

The accompanying picture is indicative of the orderly, businesslike atmosphere which invites customers to Pat's Welding Shop. The products being weld-fabricated are ladle dippers for an aluminum foundry and funnels for drainage systems.

The dippers (see left, foreground) are made of 16-gauge steel with handles of ⅜-in. round stock. A ring is solid-welded around the top of each structure to serve as a reinforcement.

The drainage funnels (center, background) consist of pipe sections 1½ to 4 in. in diameter welded to 12-gauge rings. The members for both structures are rolled to shape from strips and butt welded single pass with 5/32-in. and 3/16-in. E-6012 electrodes.

Pat's shop is a very good example of how welding can be applied to establish a profitable business in practically any community, provided that the founder is willing to work.

Pat's Welding Shop, Kansas City, Mo., is a good example of a small job shop that has turned from repair work to manufacturing. The products are foundry ladle dippers (left, foreground) and drainage funnels (center background)

Courtesy, The Lincoln Electric Co.

* Mr. Anderson is Kansas City district manager and welding engineer for The Lincoln Electric Co.

★ CONSTRUCTION

Army Engineers Show

SOME of the best of the many ingenious devices developed during the war were creations of the U. S. Army Engineer Corps. The Engineers were the road builders and "way-clearers" for the Army. To do their job effectively, they had to have heavy construction equipment that would withstand the rigors of military service. This is where welding came in.

Much of the Engineers' equipment is suited to peacetime use by earth-moving and road-building contractors and others engaged in heavy construction work. In view of this, it will be possible to turn many of the Engineers' war-inspired developments from destruction to useful purposes in making this world a better place. The accompanying Engineer Board photos show various ingenious products that were created with the aid of welding.

Since the time of Alexander the Great, the military engineer has been busy inventing a myriad of strange but workable devices. This last war he had welding to help him . . .

Rocket-Propelled Rod

One of the most unique developments is the blast-driven earth rod (Fig. 1). This unit consists of a 1½-in.-diameter rod, pointed on one end with a 4-in.-diameter, foot-long cylinder welded on the opposite end. The cylinder serves as a firing chamber in operating the rocket-propelled rod.

Six Feet into the Ground

To drive the rod, a special propellant charge is placed in the firing chamber and firmly tamped. When fired by a squib, the main rod is driven a long distance into the ground, as is shown in Fig. 2. When the rod is removed, it leaves a 1½-in. round hole approximately 6 ft long. This hole is then enlarged by the use of multiple primacord explosive strands or by the use of a special springing explosive charge supplied with the set. By the use of these explosives, two men can blast a 6-ft, 12-in.-diameter hole in clay or gravel soil in 20 minutes. In comparison, a power earth auger requires 45 minutes to dig the same hole.

In wartime operations, this welded blast-driven earth rod was especially suited for digging holes for use in cratering charges, bridge abutment demolitions and for telephone poles and log obstacles. Peacetime applications immediately suggest the digging of post holes, holes for telephone poles or similar construction operations by public utilities.

Trailer for Power Launch

Fig. 3 pictures a welded four-wheeled trailer designed to carry a power launch, frequently used by the Engineers as a tug boat in their river-crossing and water-construction operations. This trailer is unique in that it permits one man to launch a 30-ton boat. The launching is accomplished by extending the trailer tongue and backing the trailer into the water. The boat cradle, which is mounted on rollers, then rolls

Fig. 2—The rocket-driven rod goes into the earth for a distance of approximately 6 ft, making a 12-in. hole

Fig. 3—This four-wheel trailer was developed to carry a power launch for river-crossing operations

Their Ingenuity

BY T. B. JEFFERSON

rearward on the trailer frame until the boat floats free. By reversing the operation, one man can retrieve the boat. In this instance, a winch line is run from the truck to pull the boat onto the cradle, after which the cradle is pulled forward on the frame until the trailer and tongue are in a normal position for towing. Then the truck drives away.

Welded Reel Carriers

Another trailer that will find peacetime applications with power companies is pictured in Fig. 4. It was designed as a reel carrier for work on military power lines. No crane is necessary to load a reel of cable on this trailer. It is merely tipped back to engage the spindle on the spool and is then righted with the aid of a truck winch. Its all-welded construction insures its ability to withstand the severe stresses that are imposed upon the framework under such loading conditions. Power-line poles may be carried by folding the reel arms into the bed and strapping an auxiliary lunette to the end of the pole.

The heavy construction truck, Fig. 5, is of all-welded construction and patterned somewhat after the trucks so widely used in oil fields. Such a truck would prove mighty handy to have around where construction or rigging is being carried on. The derrick is demountable, and the winch may be used to pull pipe or bulky equipment over the roller tail gate. A welded pipe guard prevents damage to the cab.

Portable Scissors Bridge

The weird-looking contraption mounted atop the tank in Fig. 6 is a hydraulically operated scissor bridge developed by the U. S. Army Engineer Board to facilitate the crossing of tank ditches and canals under fire. The bridge is carried folded on the top of the tank. Arriving at an obstacle which must be bridged, two men inside the tank turn a valve to launch the bridge hydraulically. The beginning of this operation is shown in Fig. 7; a later stage in Fig. 8.

This all-welded bridge will carry a 35-ton tank over a 42-ft span. After all of the tanks have crossed, the launching vehicle follows them to the other side and picks up the bridge. It then moves on to repeat the operation at the next point that must be bridged. This ingenious idea may not seem to serve any useful peacetime purpose, yet highway

Fig. 1—Rocket-propelled hole digger. The cylinder welded to the upper end serves as the firing chamber

Fig. 4 — Power companies and telephone companies should find many jobs for this handy reel carrier

Fig. 5—A heavy truck of all-welded construction. It has a demountable derrick to load heavy equipment

Fig. 9 — Hydraulic jacks raise the front end of this tractor to prepare it for a trailer trip on a highway

departments should find the folding bridge extremely handy as a temporary repair measure when bridges are damaged during floods or from other causes.

Self-Contained Trailer

Another Engineer development should interest contractors who find that they must frequently move their equipment. This is a pneumatic-tired crawler tractor designed to be transported as a trailer load at high speed over paved highways. To prepare the tractor for such a trip, the operator simply turns a valve, which raises the front end of the tractor by means of built-in hydraulic jacks (Fig. 9). He then elevates the rear end by lowering the pneumatic-tired wheels, which are mounted on two hydraulic pistons on the rear of the tractor. With the tractor in this elevated position, a two-wheel dolly is quickly installed under the fifth wheel at the front. The tractor is then ready for transportation over paved highways as a trailer load, as is shown in Fig. 10.

Fig. 10—Pneumatic-tired wheels are lowered at the rear (see Fig. 9)

Fig. 6—Tank-mounted scissor bridge in the folded position

Fig. 7—Hydraulically operated, the bridge unfolds as shown

Fig. 8—A later stage in unfolding. The bridge will cross a 42-ft span

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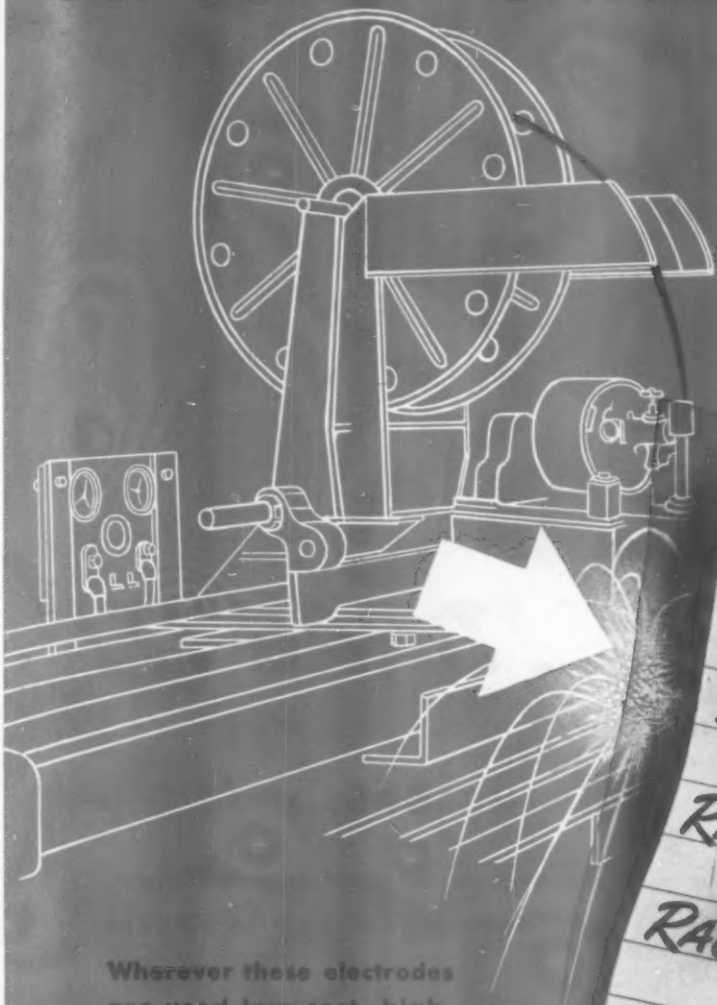

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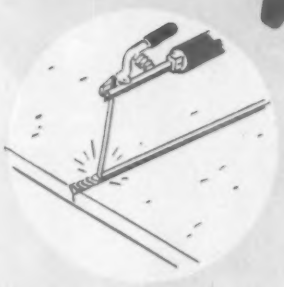

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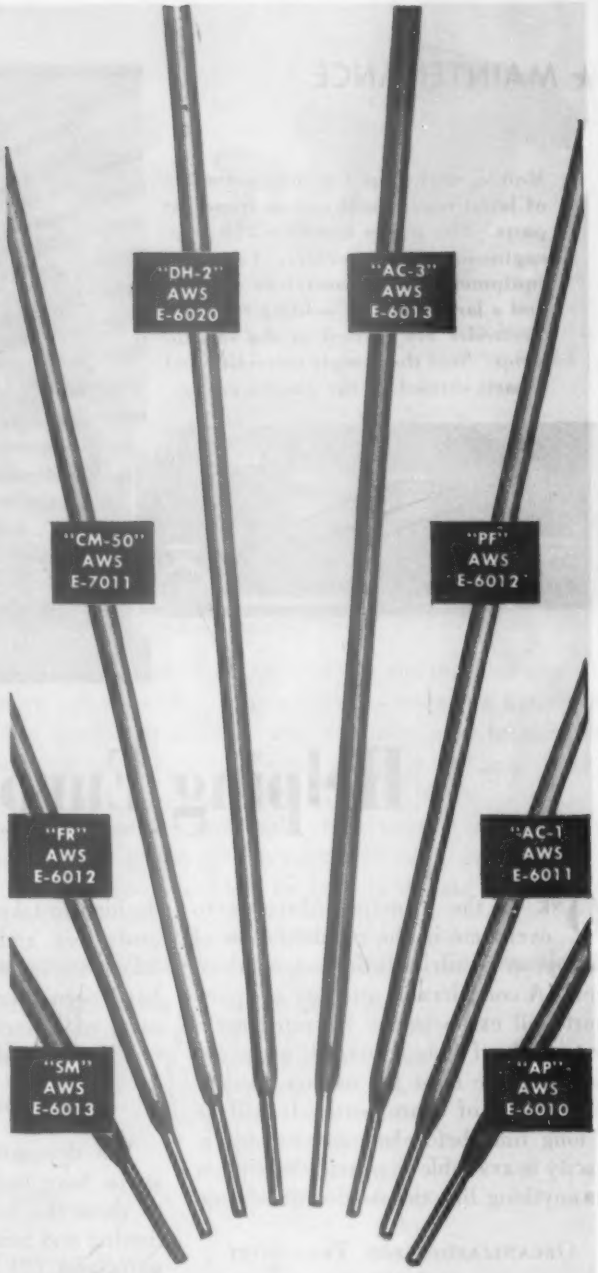

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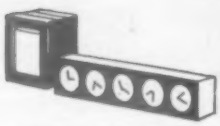
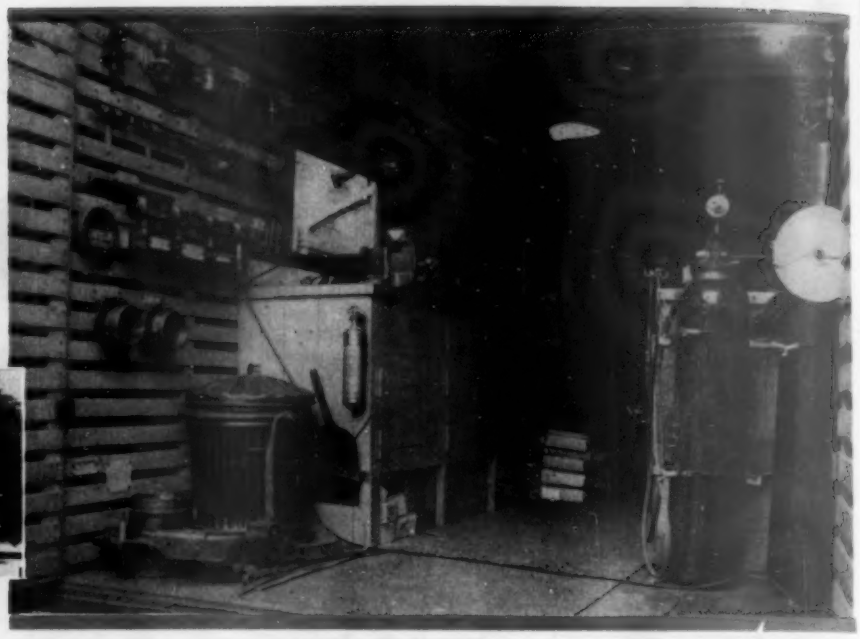


WELDING PRODUCTION CONTROL SYSTEMS

ELECTRIC HOISTS



Mobile workshop for demonstration of latest repair methods on transport parts. The trailer houses a 250-amp, engine-driven arc welder. Complete equipment for oxy-acetylene welding and a large stock of welding rods and electrodes are carried in the van interior. Note the sample reconditioned parts carried on the display racks

Helping Europe to Help Itself*

One of the principal obstacles to overcome in the rehabilitation of European countries is the lack of transport. A considerable quantity of transport still exists in the liberated areas but much of it is damaged, worn out or otherwise unfit for use on account of the lack of spare parts. It will be a long time before manufacturing capacity is available to provide new parts in anything like the needed quantities.

Organization for Transport

The Provisional Organization for European Inland Transport came into being to advise and guide governments and local authorities concerned in the problems of coördinating the movement of transport recovery. The Organization faces a similar problem to that of England in the grim years 1941-45. During that period, one of the main measures adopted by the Ministry of War Transport was the utilization of a specialized group of experts, touring the country with the necessary equipment, to demonstrate to large users of commercial vehicles ways and means whereby broken or worn parts could be reconditioned or repaired by welding. Improving conditions in Britain made this service no longer essential, and the Organization decided to take over some of the demonstrators and mobile vans to help other European countries. Two vans have been taken over by the Government of France, one by Belgium and one by Holland.

Duties of Demonstrators

The demonstrators with the workshops have two principal duties: (1) to show the best methods of reconditioning and recovering worn or broken parts and (2) to instruct workers in the rehabilitation of surface transport systems. The demonstrations are given to experienced weldors (who are also mechanics) so that they, in turn, may act as instructors in the workshops in their areas. No training of unskilled workers is being done.

It was anticipated that within a few weeks of the start of the Organization a large amount of immobilized equipment would be able to resume work, including rail cars, lorries, motor barges, tugs, cranes, etc.

Arc and Gas Equipment

Each of the mobile workshops is equipped with a complete oxy-acetylene welding plant including torches, tools and adaptors for interchangeability with Continental-type oxygen and acetylene cylinders. A 250-amp portable arc welder is carried in a trailer. In addition, there is a compressor driven by a power takeoff from the gear box, a 4-in. bench lathe also driven from the gear box and a portable grinding wheel and portable drill driven by flexible power shafts from the welding generator. The van is not equipped for the finish machining of parts as facilities for such work are certain to exist in local workshops.

A wide range of makes and types of electrodes and welding rods are carried. The stock is sufficient to leave a small supply of rods for use at points where this is deemed necessary. A box of refractory bricks is also carried to enable a preheating or stress-relieving oven to be assembled on the spot.

Sample Parts Displayed

A number of sample reconditioned and repaired parts are carried on racks round the inside of the van (see picture), and the demonstrators are prepared to give full details and directions of the methods that were used to reclaim any part. So great a variety of parts are carried that practically everyone who attends a demonstration should find something to interest him.

* Reprinted from the British Journal, *Engineer*.

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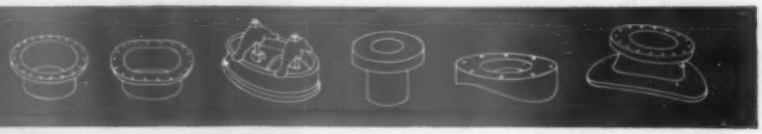

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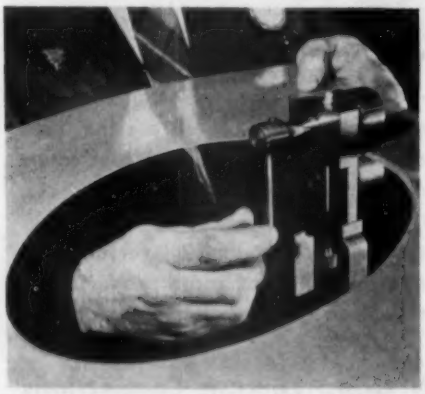
Short Cuts and Kinks

Do you know of a better way to do it—a way that is faster, easier or more economical than the method usually followed? If you do, why not pass it along? Send anything you think suitable for this section to: Short Cuts and Kinks, The Welding Engineer, 520 North Michigan Ave., Chicago 11. Payment will be made at our usual rates.

Crimping Rolls

By Frank Lucarelli

I RECENTLY perfected an ingenious device for crimping sheet metal up to 16 gauge. This tool has really proved to be a time-saver for us at The Glenn L. Martin Co. It will work equally well on straightedged sheets or pieces curved to any shape, on the insides of blanked-out holes or wherever crimping may be required.



A new tool developed for crimping sheet metal up to 16 gauge on the job or after installation. The tool is applicable to any job

In its general shape, the tool is not unlike the familiar can opener attached to the kitchen wall. Two round dies, one with a projecting edge, the other rounded to fit, are held together by spring tension and an adjustable screw that fits them for various thicknesses of metal. Turning a crank pulls the metal sheet between the dies. The edge of the metal, held firmly against a guide, is crimped to the desired shape. The operation requires no more physical strength than to open a can of food in the kitchen, and the time saved is at least half of that required with any other hand tool which would perform the same job.

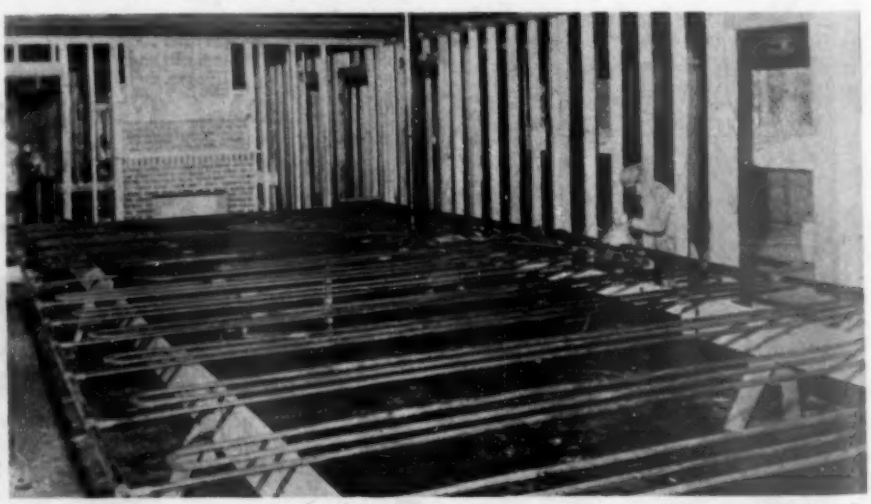
The tool may be operated by clamping it in a bench vise, probably its most widely used place. By substituting a wheel for the conventional handle (with little sacrifice in leverage), it can also be used right on the piece needing crimping after it has been installed in the airplane, or a new crimp can be put into a piece of sheet metal without having to completely remove it from the ship. Ratchet wheels may be installed in the device so that there is no slipping.

Previous methods of hand crimping required a tool like an oversize pair of pliers which was literally pulled around the edge of the metal by sheer strength. The tool would sometimes slip off under the pulling necessary to make it operate, resulting in a nasty gash in the operator's arm. This safety hazard is entirely eliminated in my new device.

☆ ☆

Welding Heating Coils

TO FACILITATE the welding of wrought-iron radiant heating coils, the R. G. Chapman Co., Tacoma, Wash., used an array of low wooden saw horses during the installation of the heating system at the residence of a Tacoma citizen, Joseph Henderson. The saw horses served very well as an inexpensive welding jig (see picture).



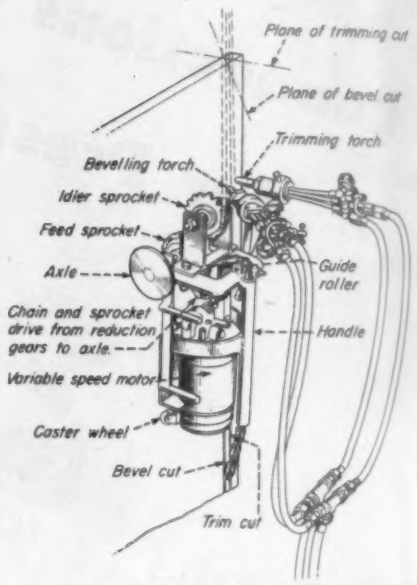
Courtesy, A. M. Byers Co.

These wrought-iron coils for a radiant-heating system were laid out on saw horses for welding

Vertical Flame-Cutting

By Charles E. Knapton

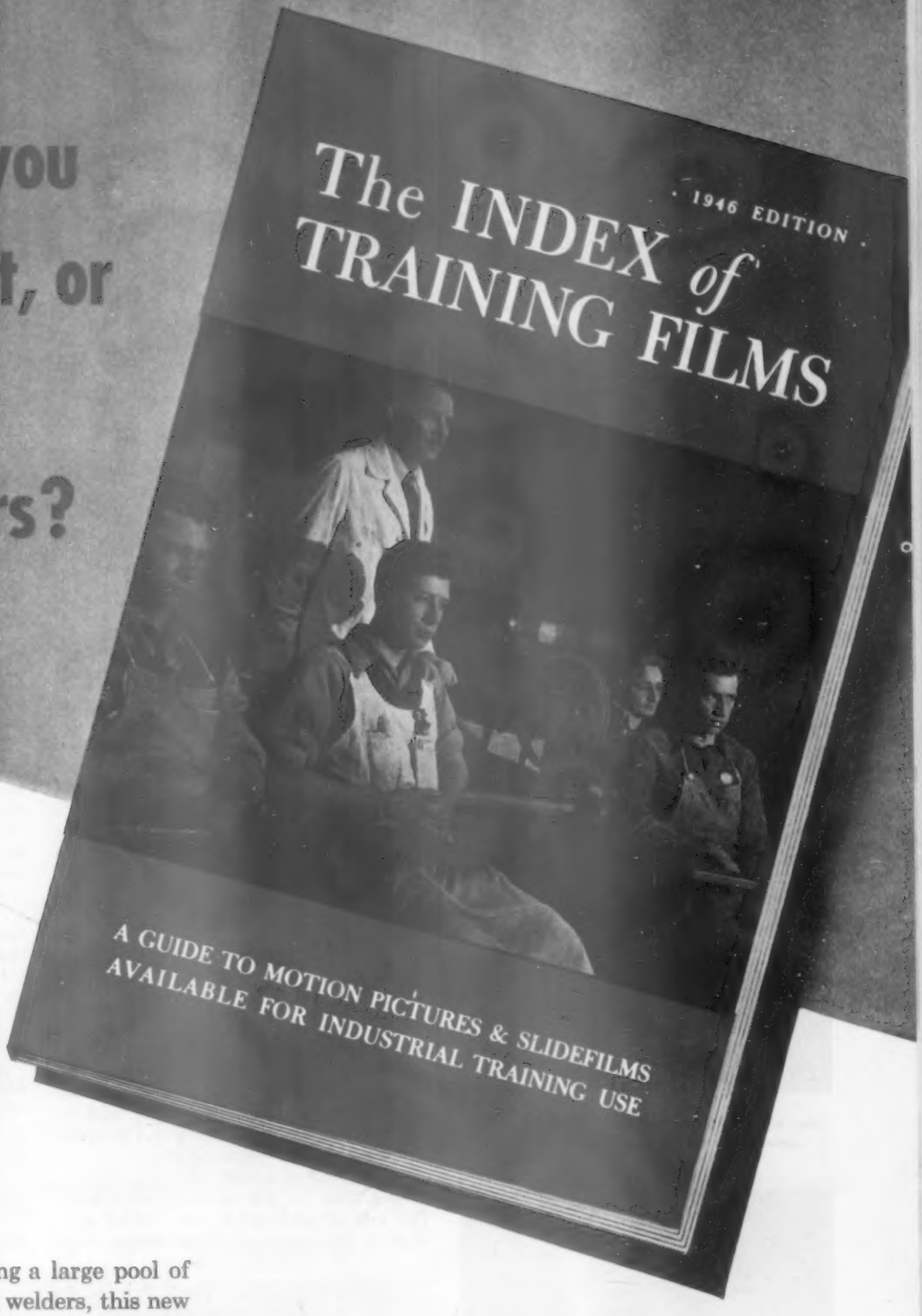
TO SIMPLIFY the difficult job of making vertical flame-cuts, I suggested an electrically driven machine to the War Production Drive Committee at Richmond No. 1 Shipyard. The use of this idea saves us 1,600 man-hours per month in the trimming and beveling of the vertical butts of fore and after peaks and the numerous vertical shell butts.



Vertical flame-cutting device. The machine mounts a bicycle chain affixed to the plate

The heart of my idea was to replace one of the drive wheels on the flame-cutting machine with a sprocket operating on a bicycle chain. The machine would thus climb the long length of bicycle chain affixed to the vertical plate. A heavy spring holds the lower end of the chain taut so that the machine is pulled against the plate. The only care that must be exercised in the operation of this device is to be sure that the upper end of the chain is affixed so that the torch will travel along a straight line.

Where can you borrow, rent, or buy films to train welders?



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Portable Blasting Machine

By George C. H. Perkins

THE USUAL WAY of cleaning silver-brazed joints is to take a file and try to smooth them down as neatly as possible. This tedious, time-consuming job often does not result in a joint of neat appearance.

I devised a faster and more economical method for cleaning the joints of refrigeration coils and for the removal of flux, oxide film and excessive brazing material. My suggested plan was submitted to and accepted by the U. S. Navy Civilian Suggestion System in the Boston Navy Yard. Essentials of the idea are shown in Fig. 1. A small chamber is fitted around the pipe to permit the joint to be grit blasted. A small amount of metal grit is then placed in the open blast chamber and agitated by means of air pressure. As Fig. 2 shows, wire screens are used to prevent the grit from entering the air intake or exhaust when the two halves of the blasting chamber are closed around the joint. Two-and-one-half minutes of blasting is all that is needed to produce the clean joint pictured in Fig. 2.

The machine has a capacity of 150 joints per day—the equivalent output of 10 to 15 men using the hand filing method.

Fig. 1—This hinged blasting chamber is designed to be closed around a brazed joint

Fig 2—Wire screens prevent the metal grit from entering the air intake or exhaust

☆ ☆

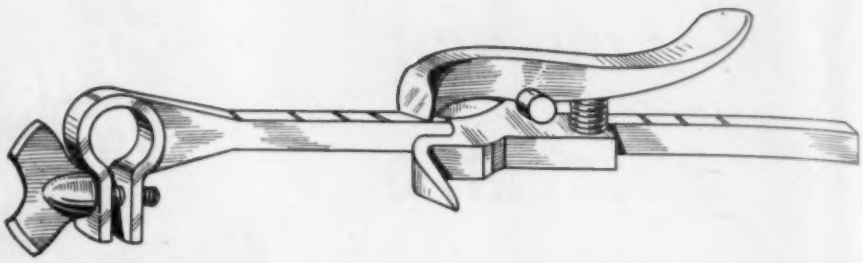
Cutting Torch Radius Arm

By Harry E. Howsman

IN THE particular job that I was engaged in at Richmond Shipyard No. 2, Richmond, Calif., it was necessary to flame-cut four holes of different sizes in a plate. These holes were ¾, 1, 1¼ and 1½ in. in diameter. The usual practice was to cut one hole and then make a new setting to cut a different size. This necessitated resetting of the torch at least four times or, in the case of multiple operations, handling the plates at least four times before the job was completed.

To eliminate these excessive handling and resetting operations, I suggested a new type of flame-cutting guide to the War Production Drive. This guide, which is essentially an adjustable radius arm, is pictured in the accompanying sketch. It is devised to slide into grooves set at the proper locations to cover all sizes of the holes to be flame-cut. There is no tedious adjustment to be sure that the proper radius has been selected; all that is necessary is to slide the point on the radius arm into the proper groove.

The suggestion, immediately adopted, resulted in a saving of 140 man-hours per month. Not only was my new radius arm suited for cutting out the four sizes of holes before mentioned, but it was also used to cut valve control wheels in eleven different sizes.



Adjustable radius rod designed to speed the flame-cutting of holes of varying sizes. The guide slides into grooves that are set at the proper locations to cover all sizes of holes to be cut

Pipe Jig

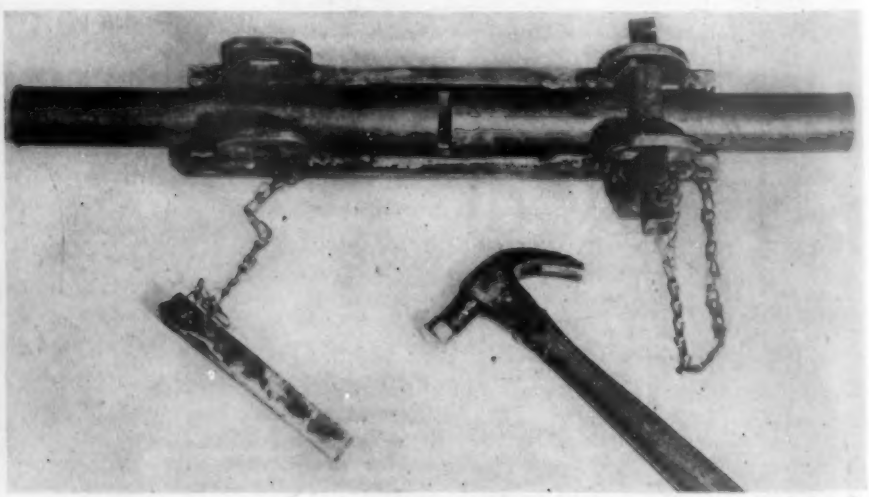
By Lee Fullerton

ANYONE who does pipe welding finds it necessary to align the pipes properly so that a neat joint may be made. There are many methods of positioning pipes for welding, and a great many different ideas have been used. Some of these were successful in certain locations but would not work in others. To overcome this difficulty, I designed a pipe jig that will work anywhere.

It was made primarily of scrap, as may be seen from the accompanying illustration. Two sets of guide clips were welded to a piece of flat bar stock. Two wedges were flame-cut from scrap and ground to fit the clips.

It is an easy matter to place the pipes to be welded between the clip guides and drive in the wedges so as to hold the two ends tightly in place. Proper alignment is thus coupled with secure holding for welding. After the weld has been partially made, the wedges may be loosened and the pipe turned to expose the unwelded portion. The jig is then retightened for completion of the weld.

This device can be used under all pipe welding conditions, and by minor adaptations may be made suitable for pipes of various diameters.



Courtesy Hobart Brothers Co.

In this pipe alignment jig, each pipe is placed between two clips and held tightly by a wedge

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Fig. 1—Welding makes new steel wheels to equip old farm implements with pneumatic tires

Fig. 2—Repairing a disc harrow draw bar which had cracked through a bolt hole (see text)

Fig. 3—Fusing braces to the cross-members strengthens the construction of this riveted harrow

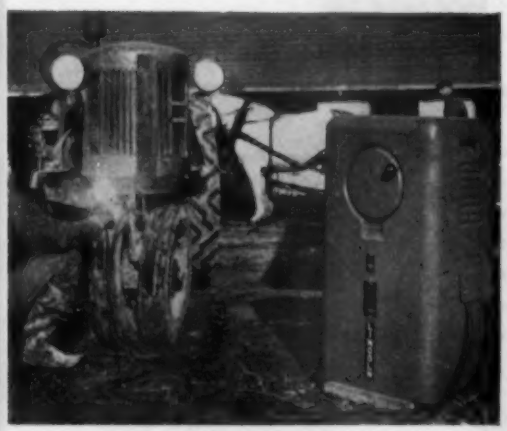


Fig. 4—Adding a front-end draw bar to a tractor is a job that can be done in a few minutes' time

Fig. 5 (below)—Welding fixes the cracked frame of a hay rake, avoids costly delay in harvesting

On the Job

Farmer's Magic Wand

THE farmer's new magic wand looks just like a welding electrode, but it is true magic nevertheless when it comes to restoring broken or worn equipment back to service. The accompanying five pictures, all reproduced through the courtesy of The Lincoln Electric Co., show some of the magic this wand can do.

In Fig. 1, Joe Benline, who is located on a farm near Chardon, O., uses his 200-amp, gasoline-engine driven welder to equip old farm implements with new wheels for pneumatic tires. He applied the finish welds with 5/32-in. mild-steel electrodes to fuse the spokes to a new rim. The hubs and spokes pictured were cut out of a discarded farm wagon wheel, but practically any old steel-rimmed wheel can be salvaged by this method, says Farmer Benline.

The draw bar of the disc harrow shown in Fig. 2 had a crack through one of the bolt holes. A 1/8-in. mild-steel electrode was used with a current setting of 110 amp to close the crack with a solid bead of weld metal. Including the time needed for bolt removal, the entire job was done in 15 minutes.

Another harrow repair is shown in Fig. 3. Here, the loose braces of a riveted harrow are being fused solidly to cross-members by means of arc welding.

The farmer's magic wand can also be used to add a front-end draw bar to a tractor (Fig. 4) or to weld the cracked frame of a side-delivery hay rake (Fig. 5). It's a matter of only minutes to make most repairs, and the restored equipment is as good as new, if not better.

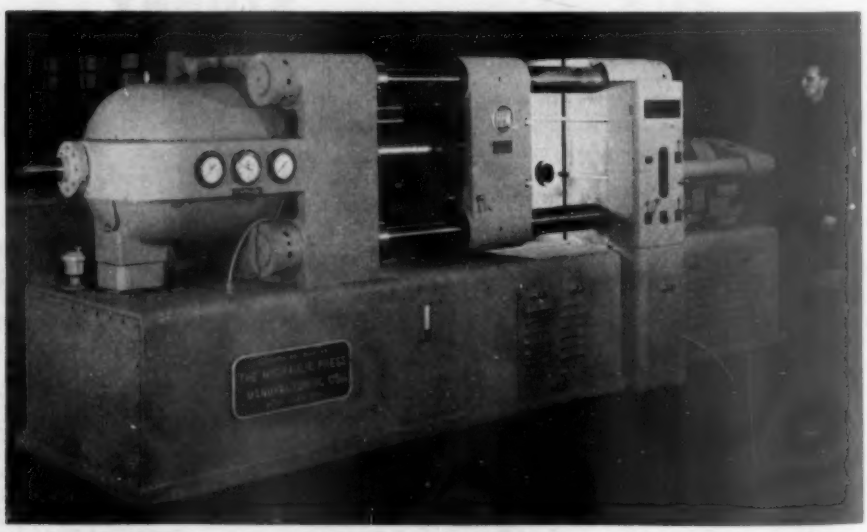
☆ ☆

Welded Die-Casting Machine

WELDING plays an important role in the production of two new high-pressure machines for die casting magnesium, aluminum and copper alloys. These self-contained machines, recently announced by the Hydraulic Press Mfg. Co., Mount Gilead, O., are of revolutionary design in that mold clamping, metal injecting, core pulling and ejecting units are all operated by direct hydraulic means.

High-pressure die casting employs the "cold chamber" process. The metal is sustained in the molten state in a conveniently located holding furnace. The operator ladles the metal into a slot that opens into the injection cylinder, commonly called the "cold chamber." The injection plunger advances, displacing the metal in the cylinder and forcing it into the closed mold.

One of these new machines is shown in the accompanying picture. The heavy base is an all-welded unit. Its various components are flame-cut to size from steel plate 3/4 to 1 in. thick, formed and welded into the boxlike structure shown in the photograph. Most of the welds are made by a submerged-melt automatic welding head.



H-P-M high-pressure die-casting machine. Its base is fabricated by welding and flame-cutting

High-pressure die casting should not be confused with low-pressure die casting, a process chiefly used for low-melting-point zinc alloys. Although some zinc die castings are made by the cold chamber process, the alloys normally cast are aluminum, magnesium and copper. Larger castings with better physical properties can be produced by the high-pressure method.

☆ ☆

Cutting up Steel Ingots

CUTTING through two feet of solid steel is an easy job for the man-sized cutting torch in the accompanying picture. This, the world's largest cutting torch, is slicing up into charging-box size the hot-top ends of a

Courtesy, The Linde Air Products Co.

The world's largest cutting torch slashes through a 2-ft steel ingot at 3 in. per minute

partially forged ingot of chrome-nickel-molybdenum steel. The ingot is 24 in. thick, and the cutting is done at the unbelievable speed of 3 in. per minute. The use of this oxy-acetylene method for cutting up hot-top scrap has resulted in savings of 50%.

☆ ☆

"Trigger Words"

"WHENEVER labor makes proposals, they are too often called 'demands.' Whenever management points out that some of these things are impractical, they are too often called 'rejections.' When solutions are worked out, they are too often called 'compromises.' Public statements by either side have a way of ending up as 'warnings' or 'threats.' All of these are what the experts call 'trigger words,' serving to raise in our minds stereotyped ideas of conflict and confusion . . . I think we need a little more light, a lot less propaganda, a little more willingness to acknowledge that, on any given question, at least two points of view are possible."—*John S. Bugas, vice-president of industrial relations, Ford Motor Co.*

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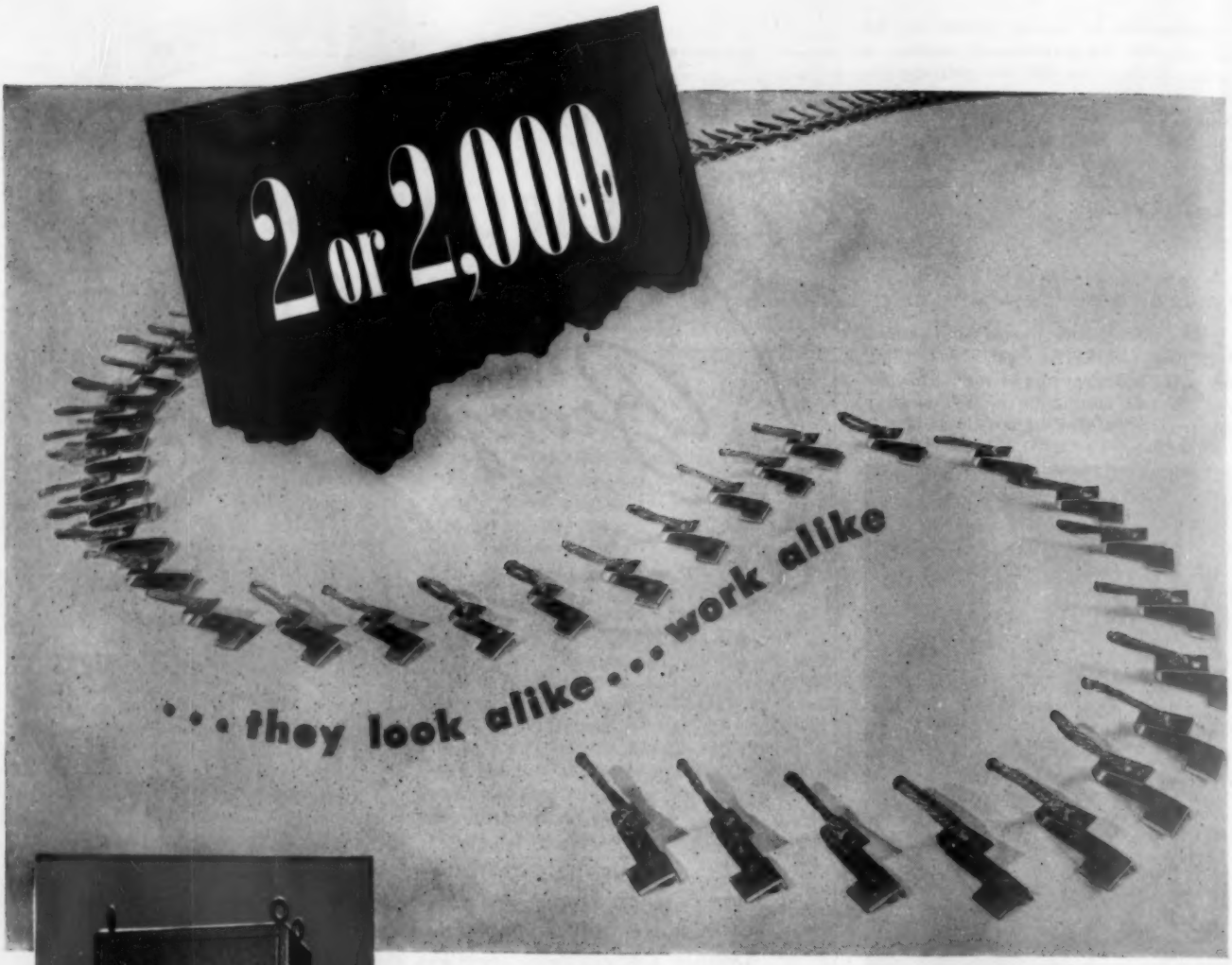

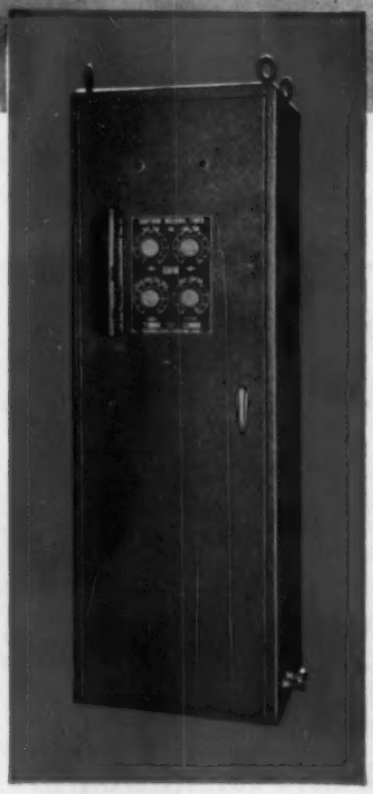

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This particular job involved thermal-overload trip elements for small circuit breakers. The working part is the U-shaped bi-metallic strip, which expands or contracts when carrying more or less load. One end is joined to a formed steel part and the other to a multi-strand, flexible copper shunt.

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Electronics at Work

Welded Ash Disposal System

By R. G. Swisher

HENRY LEOPOLD, superintendent of an extract company in Tennessee, saw a definite need for a better way and designed an all-welded ash disposal system to remove the ashes from the boiler plant.

How it works is shown in the accompanying picture. The ash car holds 1½ cu yd of ashes and is attached to two ½-in. closed-link chains. The chains run up to the top of the tower, over and around the traction sheaves and down to the counterweight car, which descends as the ash car ascends or vice versa.

The system is fully automatic. When the ash car reaches the top of the tower, the tail gate latch is tripped (position in picture) for unloading. An automatic switch then reverses the motor, and the car returns to the basement boiler room for another load. For added safety, a manually operated switch is installed at each end of the system to stop the car at any point of travel.

The whole structure was fabricated by welding scrap and salvage material. Old railroad rails formed the track and columns, and the struts and braces were made from used 4-in. boiler tubes. Bolts were used only for shaft bearings and to bolt down the reduction gear and 5-hp motor.

☆ ☆

Salvage Undersize Casting

AN IRON CASTING for a guide barrel used in a tube mill was made ¼ in. undersize on each guide because of a mistake in the pattern. The total width was thus ½ in. too narrow. Since the casting was valued at $150, the foundry decided to salvage it by welding.

The job was one of considerable magnitude. The guide barrel was 22 in. high, 28 in. long and weighed 300 lb. Using a new nickel-cored, flux-coated electrode, the weld metal was deposited without the necessity for preheating. Distortion was thus kept to a minimum.

Each guide was built up by ten passes of ⅝-in. electrode, equalling three layers. Approximately nine lb of electrodes were needed to do the job. After welding, the casting was readily machined to its correct dimensions.

Courtesy, The International Nickel Co., Inc.

Made too small, this cast-iron guide barrel was built up to the correct size by welding

Courtesy, The Hobart Brothers Co.

Tail gate latch of the ash car is tripped, and the ashes fall in a pile. Note counterweight car

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A-C WELDING IN 1946

(Continued from page 33)

ment has been lagging in the copper and copper-alloy fields. Although some phosphor-bronze electrodes for a-c welding are available, the present product is not wholly satisfactory. But several laboratories are hard at work on this problem, and better performance is expected soon.

More brands of bronze electrodes might be available were it not for the understandable pursuit of the ideal by the research-minded electrode formulators. The typical American dissatisfaction with existing products is probably one more reason for the continuing expansion of welded fabrication in the United States.

Nickel and nickel alloys are rather firmly fixed in the d-c fold. The use of "rather" was not an accidental choice of a word. The past few months have witnessed the announcement of a nickel electrode for welding cast iron with a-c or d-c. What has been done with nickel for cast iron can probably be expected to follow with other nickel materials until nickel and nickel alloys are correctly coated for a-c welding.

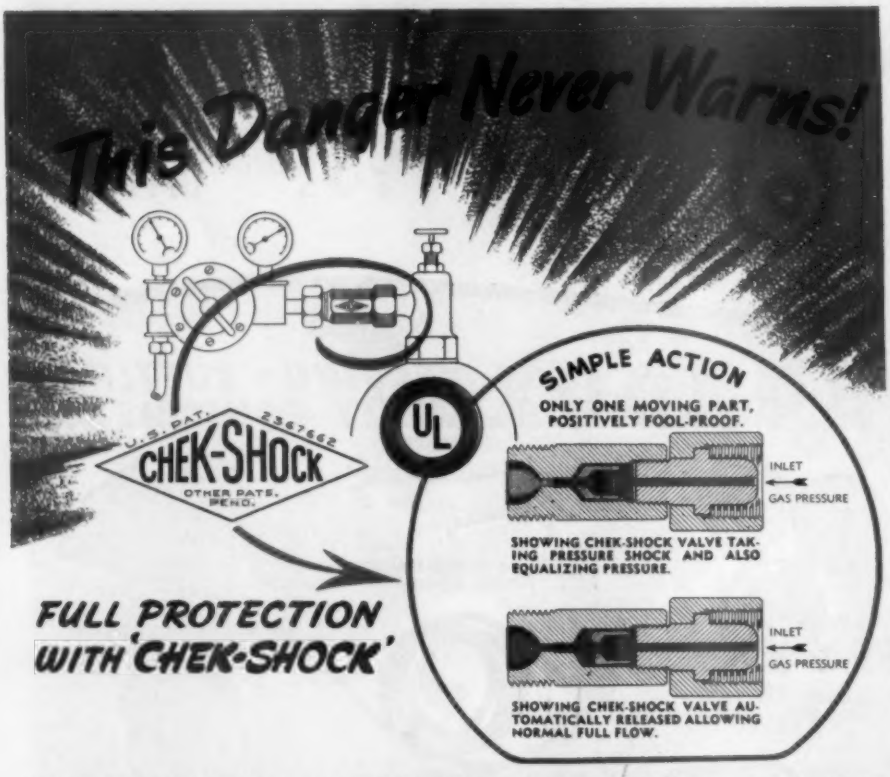
Aluminum alloys still remain in the d-c category, though there is a definite and loud clamor for a-c electrodes to weld aluminum. The difficulty of design inherent in aluminum coatings is acknowledged. Nevertheless, the brains in our industry are such that some ingenious coating compounder is sooner or later bound to break through the chemical barriers with an a-c coating for aluminum electrodes.

Situation at Present

Today the lion's share of all welding may be done with a-c. The shrinking area of welding restricted to exclusive d-c fabrication may not be appreciated from month to month. The situation is somewhat analogous to the war maps that once covered the North African campaign. The daily headlines reported regular gains, yet the territory held by the enemy seemed to be unchanged because of the larger scale being used for map distances.

Additions to the line of a-c welding electrodes do not silence a-c welding enthusiasts but merely whet their demands for products now available in d-c form only. Of such dissatisfaction springs eternal progress.

The End



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- Will prevent unnecessary internal wear in regulator (as NOT necessary to release control screw before opening tank valve).

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Swain Will Report Atomic Bomb Test

The Welding Engineer and the other McGraw-Hill business and technical publications will be officially represented at the atomic bomb test this summer by Philip W. Swain, editor of *Power*. He was scheduled to reach Bikini Atoll (Marshall Islands) on June 29.

Mr. Swain has been active on the McGraw-Hill Atomic Energy Committee since its formation in August, 1945. His background for the world's most important assignment includes degrees in mechanical engineering and experience as a machinist, artillery officer and construction engineer.

Two other McGraw-Hill editors will see the test but not cover it. Sid Kirkpatrick, editor of *Chemical & Metallurgical Engineering*, goes as one of the civilian technical observers. Donald Fink, executive editor of *Electronics*, is a member of the Navy party aboard the electronics control ship.

FLASH-WELD YOUR ALUMINUM

Helps Your Product - - - - - - and Your Pocketbook!

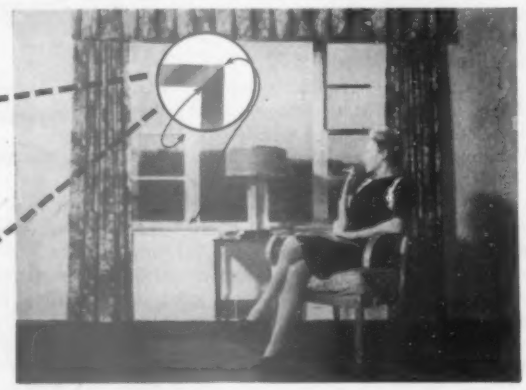
Co-operation between the fabricator and welding equipment manufacturer is always sound procedure. In the case of flash-welding aluminum, this co-operation is essential. Taylor-Winfield, a pioneer in resistance welding, can give you profitable assistance on aluminum and other metals, as evidenced by our work with many manufacturers.

The tremendous variety of aluminum shapes offers numerous design possibilities. Taylor-Winfield has developed welders to flash-weld many of these shapes.

The nature of aluminum is a factor since the electrical and mechanical specifications for welding are more exacting than the requirements for other metals. Taylor-Winfield's diversified experience can short-cut your road to full production.

Flash-welding aluminum gives you several important benefits . . . homogeneous joints, close tolerances, minimum finishing time, long runs, low unit costs . . . and a finished product which takes full advantage of aluminum's natural beauty.

Taylor-Winfield will be glad to have a representative discuss your flash or other resistance welding requirements.



A FEW EXAMPLES OF FLASH-WELDING OF ALUMINUM

Window and screen frames; frames for bunks, bicycle rims, rings, trim and mouldings; and many other applications of flat, solid, tubular, and other shapes in extruded, wrought, cast, and forged aluminum alloys.

LEFT New, fast production Taylor-Winfield flash-welder with fixtures for the precision welding of mitered joints in extruded aluminum sections.

The TAYLOR-WINFIELD CORPORATION

WARREN . . . OHIO

New Products to Use

Portable "Metalsorter" for identifying dissimilar metals by the tribo-electric effect

"Metalsorter"

A NEW device containing a thyratron-operated timing circuit, an electronic bias supply and a measuring circuit can be used for quickly identifying a chemical or metallurgical difference between two pieces of metal. This principle of sorting metals is based upon "tribo-electrification," the frictionally generated static electricity first observed in cloth-rubbed amber by Thales of Miletus around 600 B.C.

Provided with a specimen-holding chuck and a lead for test connection, the new "Metalsorter" identifies metals by means of minute electrical currents indicated on a calibrated scale. The metal to be tested is reciprocated against a standard of known composition and a reading (in micro volts) taken of the potential developed, if any. A "tribo-electric" spectrum is then consulted to determine the nature of the unknown metal or alloy.

Weighing approximately 40 lb, the "Metalsorter" is easily taken to the work and may be plugged into any convenient lighting circuit outlet. Five to 30 tests per minute can be made. CONTROL EQUIPMENT Co., 547 Brushton Ave., Pittsburgh 21.

☆ ☆

A-c Arc Welder

FARM and home now have access to a new a-c welder operating on single-phase current. This model is furnished in ratings of 130 and 180 amp, with or without capacitors. It is featured by such conveniences as a welding current scale calibrated in electrode sizes and a hand crank providing a continuous range of current adjustments. An electrode gauge, consisting of a series of calibrated notches on the bottom edge of the front panel, makes possible the quick identification of electrode size. There are two plug-in connections for electrode cable: one for use with $\frac{1}{16}$ or $\frac{5}{64}$ in. electrodes and one for $\frac{3}{32}$ in., $\frac{1}{8}$ in., and, in the larger rating, $\frac{5}{32}$ in.

Included with this welder are 15 ft of electrode cable complete with plug connector and fully-insulated electrode holder, 10 ft of ground cable connected to the welder with ground clamp attached, 10 ft of primary cable with a three-prong plug attached and a wall receptacle. GENERAL ELECTRIC Co., Schenectady 5, N. Y.

New a-c welder for farm and home use

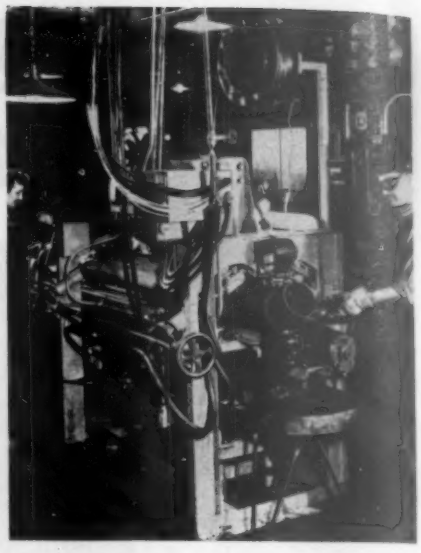
☆ ☆

Automatic Welding Fixture

A PRODUCTION fixture has been developed for automatic welding of the longitudinal seams of rounds, squares and other tubular shapes. The weld is carried from one tube to the next without interruptions due to loading or unloading. The welding head remains stationary, and the work moves under the head in a continuous stream.

Length of the tube that can be welded is dependent on the methods adopted to bring the preformed tube to the fixture to support it during welding and to remove the welded tube from the machine. Tolerance of the finished work depends entirely on the shell dimensions since the two edges of the seam are tightly butted together and do not change the size of the circumference. There are no gripping marks left on the piece, though contact is both firm and powerful.

This fixture, using any type of automatic-welding head, has a variable speed range of from 60 to 150 in. per minute of weld. The drive includes reversing and inching controls, and the speed can be altered while the work is in motion. VICTORY ENGINEERING & MACHINE WORKS, INC., 3000 Chouteau, St. Louis 3.



Automatic tube welding fixture. Speeds range from 60 to 150 in. per minute

☆ ☆

Westinghouse 20-kva portable brazer

Mobile Brazing Tongs

A NEW 20-kva portable brazer using carbon tongs is offered for general brazing purposes. This self-contained unit is enclosed in a circular steel housing and includes a contactor for energizing or de-energizing the circuit, an adjustable transformer and a water-cooling system for the tongs. The transformer is cooled by air drawn through openings under the top cover. The unit is sufficiently small (24 in. in diameter) to be lowered through hatches and manholes for work underground.

The control panel, built into the front of the brazer, contains a control switch, outlets for brazing cables, receptacle for foot switch pilot cable, and voltage changing plug. Connection may be made to either a 220 or a 440-volt power source. WESTINGHOUSE ELECTRIC CORP., Box 868, Pittsburgh 30.

Special Offer!

FOR SMALLER SHOPS WITH WELDING PROBLEMS

EUTECTIC *Low Temperature* WELDING RODS* and FLUXES

DO THESE EVERYDAY JOBS
faster, better, economically

Here's your opportunity to try a special assortment of the revolutionary EUTECTIC *Low Temperature* WELDING RODS* and FLUXES—the new development in welding that helped to lick many wartime production and maintenance problems. Now, with these superior quality welding materials you can take on the many jobs you formerly turned down—and save time, money, and materials.

EUTECTIC *Low Temperature* WELDING RODS* are a new type of welding alloys which—*1. Bond to base metals well below the melting point of the base metal. 2. Form exceedingly strong joints through surface alloying. 3. Give faster, better bonds at lower cost. 4. Avoid the dangers of stress and distortion characteristic of fusion welding and brazing.*

"A" ASSORTMENT FOR GAS WELDING —

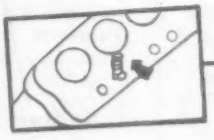
9 DIFFERENT ALL-PURPOSE EUTECRODS (incl. FLUXES)

USES	ROD NO.	
CAST IRON (GAS)	EUTECROD	14
CAST IRON (SEALING CRACKS etc.)	EUTECROD	15
STEEL, CAST IRON	EUTECROD	16
BRASS, BRONZE, COPPER	EUTECROD	18
BRASS, BRONZE, COPPER, STEEL	EUTECROD	1800
CAST & SHEET ALUMINUM (GAS)	EUTECTRODE	2100
FRICTIONAL WEAR & JOINING	BRONZOCHROM	185
ABRASIVE WEAR - EXTRA HARD	EUTECHROM	1
DELICATE ALUMINUM WORK	EUTECROD	190

$59.68
Gross Weight 39 lbs.

"B" ASSORTMENT FOR GAS & ARC WELDING —

10 DIFFERENT EUTECRODS WITH FLUXES



SAME AS "A" ASSORTMENT ABOVE BUT WITH THE ADDITION OF . . . CAST IRON (AC-DC) "COLD" EUTECTRODE 24 AC-DC AND SUBSTITUTING EUTECHROM 2 AC-DC (FOR ARC WELDING) FOR EUTECHROM 1

$62.50
Gross Weight 39 lbs.

No special equipment is required, any ordinary torch or arc welding equipment can be used. Use coupon below to order your selection of the assortment desired — each packed in a special carton with appropriate EUTECTOR Flux and full instructions. Shipped C.O.D. (25% deposit required with order), or send company letterhead with 3 trade references.

ALL PRICES F.O.B. NEW YORK PLANT:
Because of the instability of Silver Prices, etc. the above quotations are subject to change in accordance with O.P.A. authorized increases at time of shipment.

EUTECTIC WELDING ALLOYS CORPORATION

ORIGINATOR OF *Low Temperature* WELDING ALLOYS*

40 Worth Street — New York 13, N. Y.

Check assortment desired. Dept. WE-7

☐ "A" FOR GAS WELDING.

☐ "B" FOR GAS AND ARC WELDING.

NAME.....

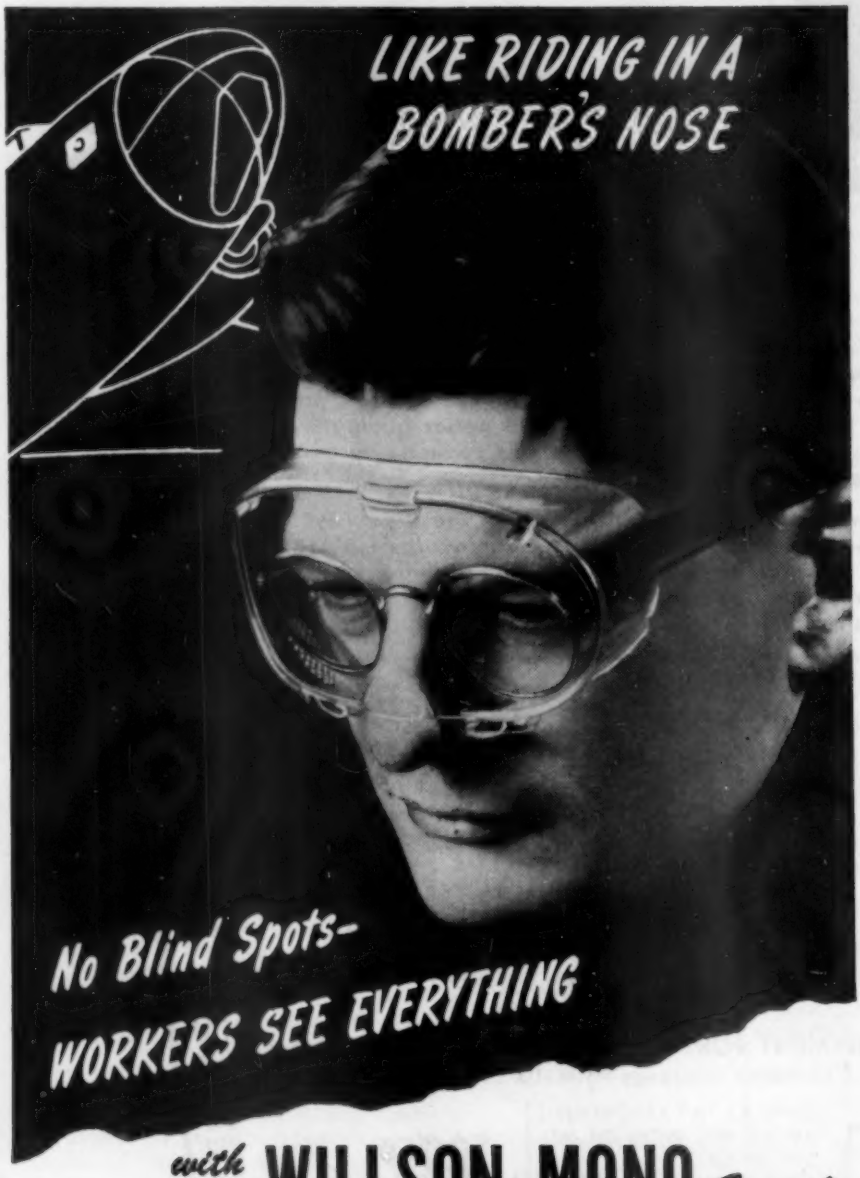
COMPANY.....

ADDRESS.....

For Your Welding Problems—Call EUTECTIC First

140 Field Engineers, in all principal cities of the United States and Canada, to serve you.

*Trade-Mark Reg. U. S. Pat. Off.



with **WILLSON MONO** *Goggle*

Clear or Willson Tru-Hue Green lenses. Clear, frosted or green frames.

Lens anchored firmly in frame but is easy to remove and replace.

The large, one-piece, plastic lens permits full view vision without distortion. With integral nose piece, the MonoGoggle provides overall eye and nose protection against the hazards of chipping, grinding, spot welding and similar jobs. Under test, the lens resisted frontal impact of a steel ball traveling 225 ft. per second.

Eyes say, "Satisfied," behind MonoGoggles because it is styled for day long comfort. It is light in weight (just over an ounce). A smooth rolled edge conforms to facial contours and an adjustable headband holds the goggle snug without pressure. And it can be worn in comfort over prescription spectacles.

MonoGoggle is made in standard and extra large sizes with 2 nose sizes; curved and flat lens styles; ventilated or non-ventilated frames.

For help on your eye protection problems, get in touch with your Willson distributor or write to 227 Washington St.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON PRODUCTS INCORPORATED
READING, PA., U. S. A. Established 1870

WILLSON 75 YEARS

Mobile arc welder for farm or factory maintenance. Built-in power factor is available

Mobile Arc Welder

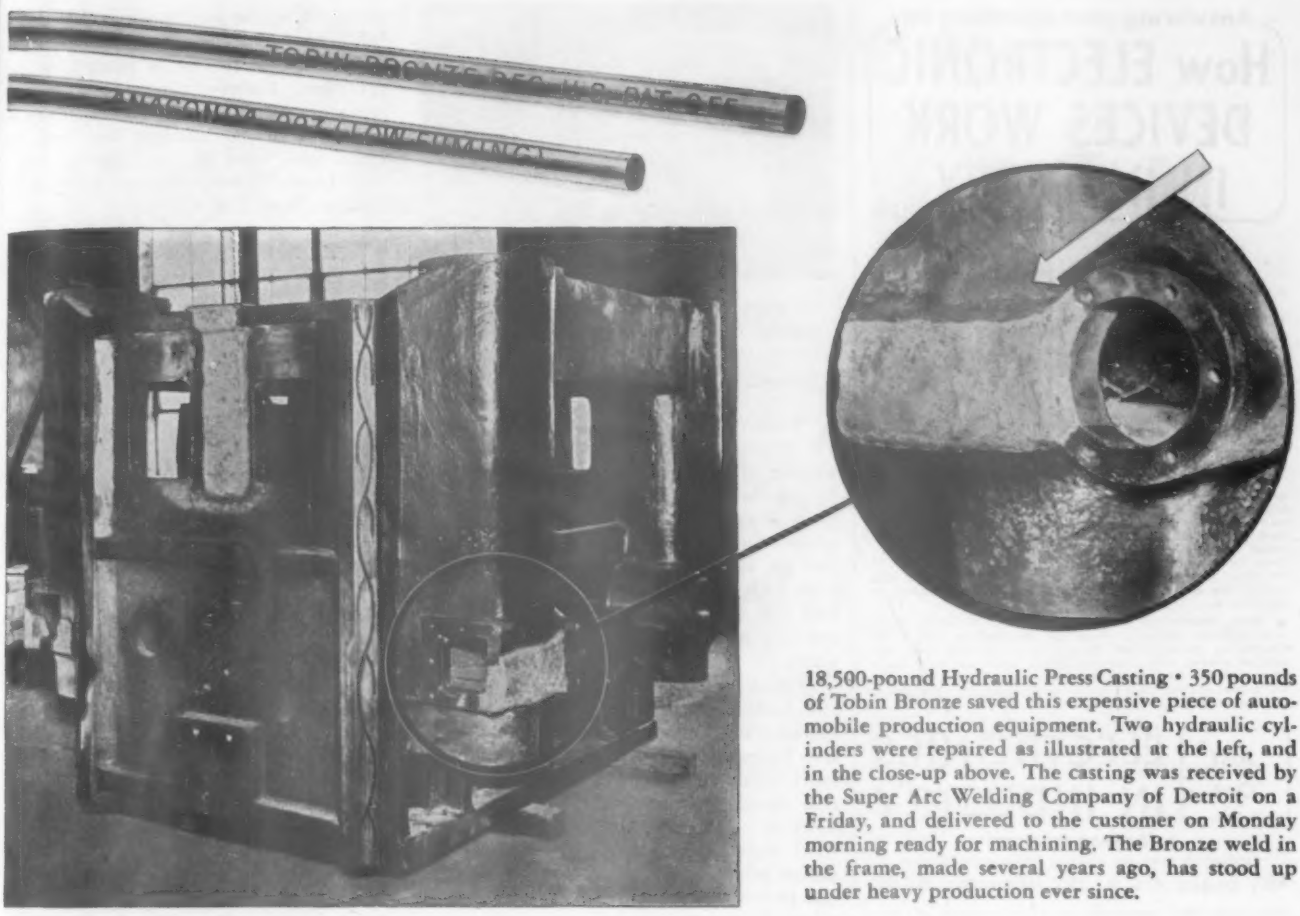
A NEW mobile arc welder, No. 185 F "Ranger," conforming to NEMA and REA specifications for use on standard 3 and 5 kva transformers, has been produced for farms and for such other applications as garage work, factory maintenance and repair, etc. Operating on 220-volt, 60-cycle, single-phase current, the welder has an output of 20 to 180 amp. Equipment includes 10 ft of input cable with a 30-amp, 3-wire plug and receptacle. To reduce the amperage draw at 220-volts, a special built-in power factor is available. LARKIN LECTRO PRODUCTS CO., 160 W. 146th Street, New York City 13.

☆ ☆

Grinding Wheel Dresser

ACCURACY and durability have been combined in the new "Samson" grinding wheel dresser, which features forced-feed lubrication that eliminates grit and dirt from the bearings and shaft hole. This unit is made in two sizes: No. 1 used on wheels up to 12 in. diam and 2 in. face, and No. 2 on wheels up to 60-80 grit and down to 3 in. diam. G. J. WALLEN MFG. CO., 617 Bryant St., San Francisco 7.

"Samson" wheel dresser with revolutionary forced-feed lubrication made in two models



18,500-pound Hydraulic Press Casting • 350 pounds of Tobin Bronze saved this expensive piece of automobile production equipment. Two hydraulic cylinders were repaired as illustrated at the left, and in the close-up above. The casting was received by the Super Arc Welding Company of Detroit on a Friday, and delivered to the customer on Monday morning ready for machining. The Bronze weld in the frame, made several years ago, has stood up under heavy production ever since.

BRONZE WELDING...*First Aid for repairs on big jobs like this*

THE ILLUSTRATIONS above are typical of the equipment on which economical, permanent repairs can be made with Tobin* Bronze, "997" (Low Fuming) and other Anaconda Bronze Welding Rods.

For years this method of low-temperature repair welding has been used for reclaiming broken, fractured or worn equipment, or for building up bearing surfaces. Almost any part made of cast iron, steel, malleable iron or copper alloys can be Bronze welded quickly, dependably, and at a fraction of the cost of new replacement parts.

Publication B-13 will tell you more about Anaconda Welding Rods for oxy-acetylene repair and construction work, and electric welding of copper and copper base alloys. A copy of this booklet will be sent on request.

*Reg. U. S. Pat. Off.

46200

ANACONDA

Anaconda

WELDING RODS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

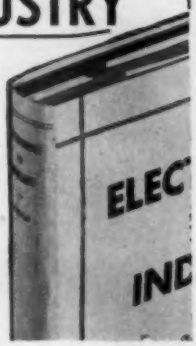
Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

Answering your questions on

How ELECTRONIC DEVICES WORK IN INDUSTRY

. . . tubes
. . . circuits
. . . the split-second operations—
clearly diagrammed and explained in this detailed manual



● Here is what you want to know about the electronic devices used in your plant. The book gives you a quick look inside vacuum tubes—to complete tubes working in proven circuits. It shows you how each part of the circuit acts during the split second and reveals the real "magic" of electronics.

● Plain description is used throughout. No long words—no difficult math—no technical descriptions are used. Everything is explained clearly and carefully with the help of almost 300 diagrams. Every effort has been made to supply the user of electronic equipment with the facts he needs to help him better understand the equipment now serving in industrial plants.

Just Out

ELECTRONICS IN INDUSTRY

By GEORGE M. CHUTE
Application Engineer, General Electric Co., Detroit

403 pages, 6 x 9, 292 diagrams, $5.00

This book offers unusually thorough coverage of electronics. It supplies a much more detailed and simplified description of the subject than is normally given. Every type of electronics tube and tube-operated circuit is treated with completeness, from the simplest tube to the most complex circuits developed during the war and in wide use today.

These 28 chapters help you understand the industrial uses of electronics

1. Choosing electronics for your needs
2. How electricity passes through an electron tube
3. Control of electron flow within a tube
4. Time-delay action
5. Tubes in A-C circuits
6. The A-C time-delay relay
7. Kinds of high vacuum tube
8. Light and heat relays
9. Controlling large currents with tubes
10. Obtaining D-C power supply for tube circuits
11. Thyratron tubes
12. Resistance-welding controls
13. Gradual control of thyratrons by phase shifting
14. Heating and light-dimming controls
15. Tube control of a D-C motor
16. Arc-welding control
17. Voltage and speed regulators
18. Large-current rectifiers
19. High frequencies and shorter wave lengths
20. Inverters, oscillators and the electronic heater
21. Temperature recorders
22. High-speed light relays
23. Register controls
24. Thy-mo-trol — Automatic tube control of D-C motors
25. Thy-mo-trol for small motors
26. Regulators of welding voltage and current
27. Electronic service instruments
28. Non-electronic devices

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Send me Chute—ELECTRONICS IN INDUSTRY for 10 days' examination on approval. In 10 days I will send $5.00, plus few cents postage, or return book postpaid. (Postage paid on cash order.)

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"Ni-Rod" deposit on a cast-iron centrifugal pump casing. No preheat was required

Electrode for Cast Iron

A NEWLY developed coated nickel electrode, "Ni-Rod," simplifies the arc welding of cast-iron by eliminating the need for preheating or other special treatment of the parent metal. The weld deposit washes evenly against all sides of the joint, and the arc is said to be stable in all positions. Chemical nature of the nickel core and flux coating makes it easy to remove the slag from the weld bead, manufacturer states.

Ni-Rod may be used to repair cracked and broken castings or to build up worn surfaces like wheels and die faces. It can also be employed for repairing welded surfaces which require good machining qualities. Another application is to fill in blowholes or other minor flaws in new castings. After such a defect has been filled, machining or grinding will make the weld deposit and parent metal appear almost identical in color. Machine errors on new castings can be easily erased by bringing the casting up to size with this new nickel rod. INTERNATIONAL NICKEL CO., 67 Wall St., New York City 5.

☆ ☆

High-Density Alloys

A NEW series of high-density tungsten alloys produced by powder metallurgy is offered for applications where high strength and density are of prime importance. The density becomes apparent by comparison with lead, which has a density of 11.3 grams per cubic centimeter. The new dense alloys are around 17.3 g per cu cm. Three different compositions are offered, containing varying percentages of tungsten, silver, cobalt copper, nickel, etc. These alloys are readily machinable, and they can be brazed or soldered by commercial standard methods. Other advantages result from their self-fluxing properties. CALLITE TUNGSTEN CORP., Union City, N. J.

☆ ☆

Self-Propelled Railway Welder

TWO new self-propelled welders in 300 and 400 amp sizes will soon be available for all railway welding. A gasoline engine drives the arc-welding generator and furnishes power to operate the heavy-duty electric motor that drives the rear wheels along the railway track. Speed varies from practically nothing up to approximately 20 mph, with sufficient power to tow a work car carrying 8 or 10 men. Transverse tracks permit it to be easily derailed from the main track to clear the way.

Electric controller for driving the car forward or in reverse is located for hand operation. Throttle control and hydraulic brake are foot-operated. The operator's seat has a large compartment for tools that, when open, may be used for welding or work bench. HOBART BROTHERS CO., Hobart Square, Troy 1, O.

Self-propelled railway welder in 300 and 400 amp sizes. It has its own derailing tracks

☆ ☆

Chip-Proof Gauge Lens

"PLASTI-GLASS," a new shatter-resisting chip-proof lens for oxygen and acetylene gauges is said to eliminate one half the repairs ordinarily needed on pressure regulators. These crystals are as transparent as glass and are designed to fit all standard welding gauges. PLASTI-GLASS PRODUCTS CO., 619 W. Washington St., Chicago 6.

Shatter-proof lens for pressure regulators

☆ ☆

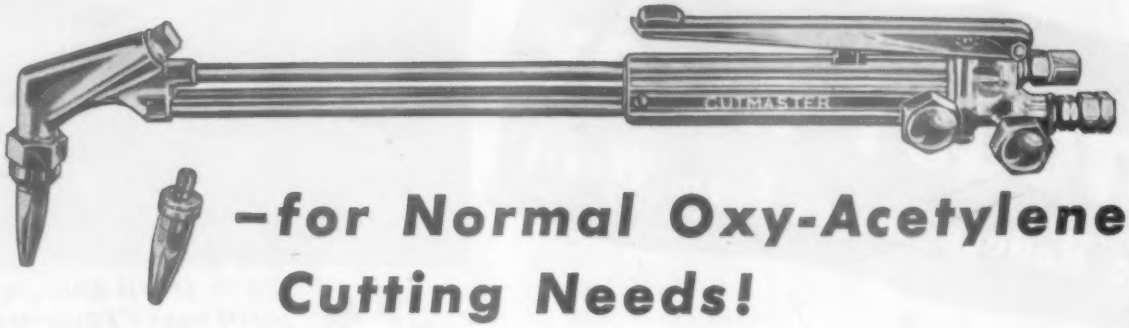
Water-Soluble Solvent

UTILIZING the principle of "constant float protection," Oakite composition No. 98 is used primarily in pressure-spray washing machines for removing light shop dirt and non-pigmented stamping compounds from steel and aluminum work. Non-toxic and non-flammable in solution, it blankets and protects the clean solution underneath. The floating layer is periodically skimmed or permitted to overflow to avoid thickening. Maximum temperatures should not exceed 150 F. OAKITE PRODUCTS, INC., 57 Thames Street, New York City 6.

(Continued on page 78)

You Can't Go Wrong on a

Meco **CUTMASTER**



–for Normal Oxy-Acetylene Cutting Needs!

Here is a Cutting Torch which provides *all* the features your experience has taught you are necessary to do any normal Oxy-Acetylene cutting — note these features carefully:

1. Perfect balance—easier to handle
2. Rugged tripod construction
3. Velvet touch cutting valve lever with thumb operating locking device
4. Forged head and valve body—patented head mixer
5. Monel Tubes—heat resistant
6. Precision drilled cutting tips with 6 pre-heat orifices properly converged to speed up pre-heating and save gases.
7. Patented method of tip connection eliminates all problems of gas leakage at the cutting tip.
8. Patented spring loaded torch valves insure uniform flame adjustment

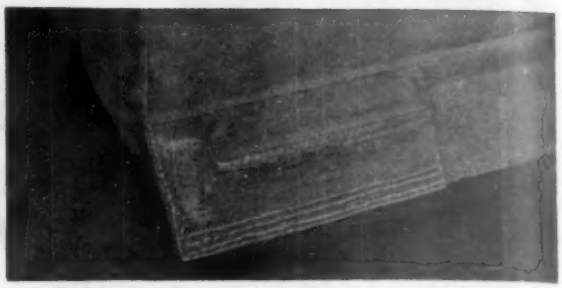
A simple demonstration will convince you that the MECO Cutmaster is the Torch you should use.

MODERN ENGINEERING COMPANY, Inc.

3401-15 PINE BLVD. ST. LOUIS 3, MISSOURI

MOVING EARTH... or FORMING METAL...

There's a STOODY ALLOY To Reduce Losses From Wear!



IF YOUR EQUIPMENT is subject to *any* type of wear there is a STOODY alloy to make it last longer — serve you better — substantially reduce operating costs. These alloys have a wide range of industrial use, prolong life of all types of wearing equipment, whether it moves earth, forms metal, is subject to metal-to-metal attrition, heat or corrosion.

STOODY alloys are made in welding rod form and are applied to wearing surfaces by oxy-acetylene or A.C.–D.C. electric welding methods. All desirable characteristics are present as deposited—no subsequent treatment is required. You'll find STOODY alloys low in cost compared to the tremendous savings they make in reduced downtime and extended operational life of wearing apparatus.

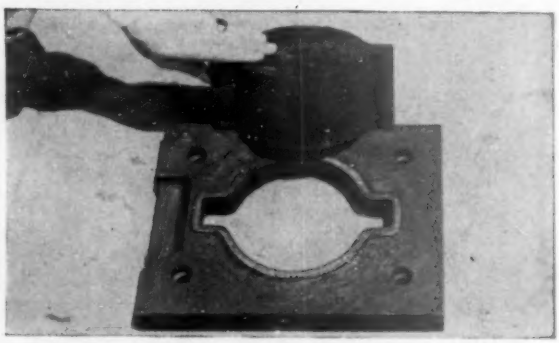
A STOODY ALLOY FOR EVERY WEAR PROBLEM

There are 12 STOODY alloys, each with special characteristics designed to retard all forms of wear...keep equipment on the job from 2 to 30 times longer—proved in industry for more than 20 years. If wear is an important factor in maintaining equipment, investigate STOODY alloys *today!* Our engineering department will gladly help.

FOR EARTH ABRASION ON HEAVY EQUIPMENT

STOODY SELF-HARDENING is highly resistant to earth abrasion and impact, bonds readily with manganese steel—it is not subject to chipping and is easy to apply with A.C.–D.C. electric welding or oxy-acetylene torch.

A very small amount of STOODY SELF-HARDENING applied to end plates of bulldozers, for example, will keep plates in operation up to four times longer, protect the expensive scraper blades, keep the 'dozers operating at full efficiency. Also suitable on power shovels, tractors, conveyor buckets, crushers, dippers and manganese parts where earth abrasion with impact is encountered.



FOR HEAT AND IMPACT

STOODY 6 is highly resistant to both heat and impact besides abrasion; retains hardness even at red heat. It forms smooth, dense, non-porous deposits that are readily machinable with sintered carbide tools; is unaffected by corrosive media. Use STOODY 6 for prolonging life of hot trimming and punching dies, high temperature-high pressure valves, exhaust valves and other parts subject to abrasion, heat, impact and corrosion.

The free booklet "STOODY ALLOYS" describes each alloy and tells you where it can be profitably used. Write today!

STOODY COMPANY

1141 West Slauson Avenue • Whittier, California

STOODY HARD-FACING ALLOYS

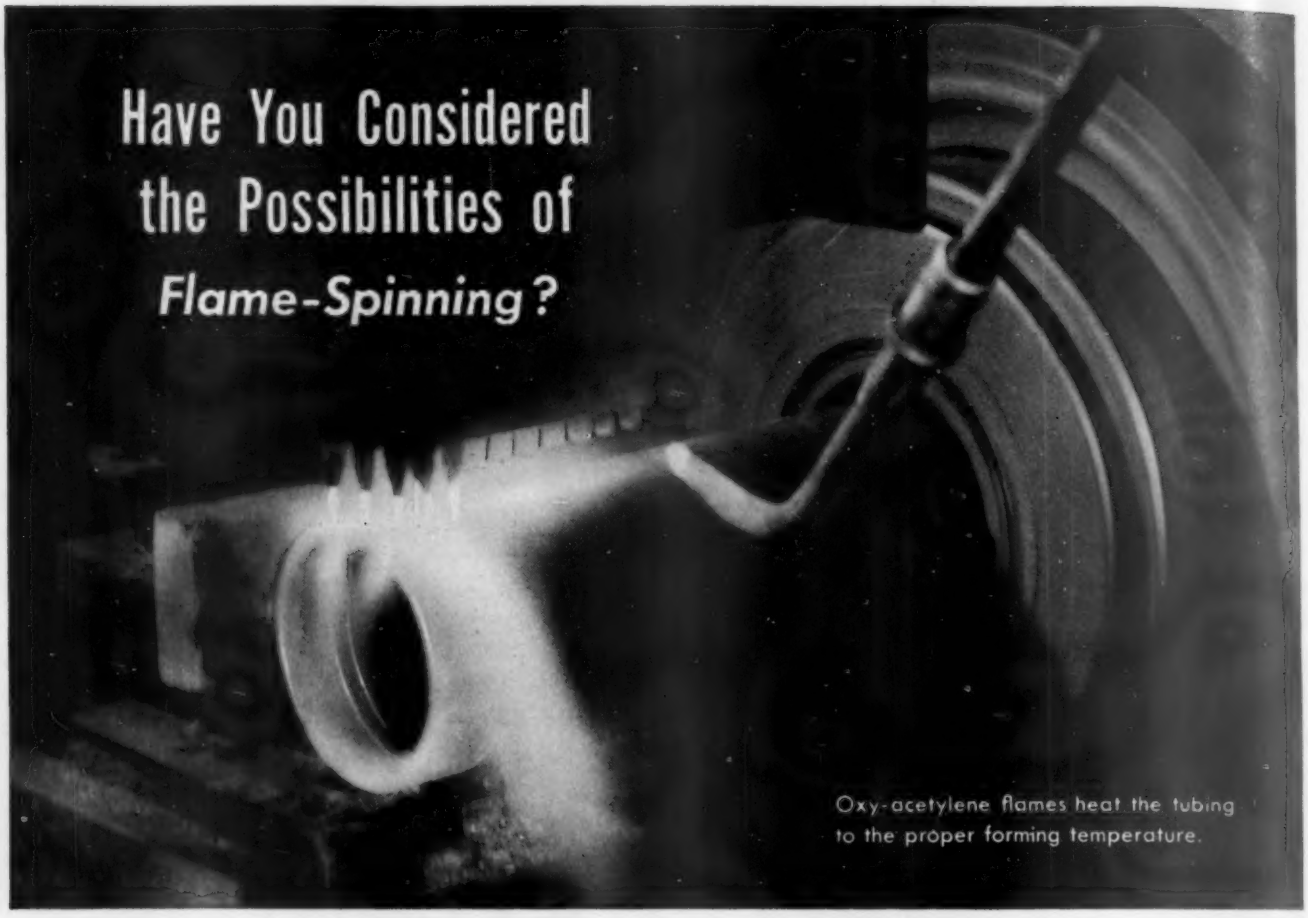
Retard Wear Save Repair

Properties of Metals

Metal or Alloy	Wt/cu ft	Specific Gravity	Melting Point F	Yield Strength	Tensile Strength	Elongation	Brinell Hardness	Modulus of Elasticity 10^6 psi	Thermal Conductivity Btu/sq ft hr/°F/in.	Electrical Conductivity %Copper	Electrical Resistivity Ohms/cmf	Coefficient of Expansion °F x 10^{-6}
Aluminum, 99%	165	2.72	1220	5,000	13,000	35	23	10.2	1570	59.0	17.6	13.8
Antimony	417	6.67	1166				30	11.2		4.0		6.7
Arsenic	367	5.72	1497							4.5		2.14
Bismuth	612	9.8	520				9	4.6		1.3	670	7.47
Brass, Yellow	535	8.6	1660	18,000	40,000	60	60	14.0		26.0	40	
Bronze, Aluminum	481	7.7	1905	30,000	76,000	55	125	15	173	15.0	80	16.5
Bronze, Manganese	522	8.38	1598	25,000	60,000	30	100	15	700	25.0	42	11.7
Bronze, Tobin	535	8.6	1625	24,000	54,000	40	100	15	810	25.0	42	11.9
Cadmium	540	8.64	1610		9,200	20	20	7.1		34.0		16.6
Chromium	419	6.7	2740				350			55.0		4.5
Cobalt	550	8.8	2700		35,000		125			16.0		12.4
Copper	557	8.93	1981	10,000	32,000	40	30	15.8	2680	100.0	10.4	9.8
Everdur	534	8.57	1866	20,000	55,000	50	95	15.0				9.6
Gold	1204	19.3	1945		17,000	45	25	13	2000	71.0	14.6	7.8
Inconel	534	8.57	2540	35,000	85,000	45	150	30	420	7.8	100	7.2
Iron, Cast	450	7.22	2300		25,000	0.5	180	13	310	2.9	400	6.0
Iron, Malleable	462	7.42	2300	37,500	57,000	22	110	12.5				6.6
Iron, Pure	490	7.86	2795	19,000	38,000	45	67	30.1	470	17.5	57	6.8
Iron, Wrought	480	7.76	2750	27,000	40,000	14*	97 to 105	29.0	418	15.0	87	6.7
Lead, Chemical	710	11.4	620	1,900	2,500	50	5	2	240	8.0	124	16.4
Lead, Tellurium	707	11.34	620	2,200	3,000	45	6	2	240	8.0	124	16.4
Magnesium, 99%	108	1.74	1240	13,000	25,000	4	40	6.5	1090	37.0	27	14.3
Manganese	475	7.3	2246		130,000	60	200			35.0	29	12.8
Molybdenum	651	10.3	4532	100,000	140,000		147	50.2		35.0	29	3.1
Monel	551	8.84	2400	35,000	75,000	40	125	26	180	3.6	290	7.8
Nichrome	517	8.19	2460	50,000	70,000	5	170		135	1.5	675	13.7
Nickel, 99%	556	8.91	2650	8,500	46,000	28	85	30	575	18.8	57	7.4
Nickel Silver 18	546	8.75	2030	20,000	58,000	40	90	18.5	230	8.3	17.5	10
Platinum	1330	21.4	3218	10,000	24,000	24	25	24	480	15.0	64	4.9
Silicon	147	2.34	2588					16.5		1.6	650	3.5
Silver	655	10.5	1762	8,000	23,000	50	30	10.5	2900	106.0	9.6	10.6
Steel, 0.15C	490	7.85	2700	40,000	60,000	35	130	30.0	460	14.5	72.0	6.7
Steel, 0.30C	490	7.85	2600	52,000	84,000	24	170	30.0	460	14.5	72.0	6.7
Steel, 0.50C	490	7.83	2500	72,000	98,000	26	201	30.0	460	14.5	72.0	6.7
Steel, Manganese	495	7.93	2450	75,000	118,000	22	300	29.0				6.7
Steel, Nickel (2330)	490	7.85	2600	84,000	105,000	25	217	30.0				6.7
Steel, Cast	490	7.85	2600	40,000	72,000	26	140	30.0	400	16	60	6.7
Steel, Stainless (304)	495	7.93	2550	35,000	85,000	55	160	29.0		2.0	460	9.3
Tin (Cast)	458	7.28	450	1,710	3,130	70	5.9	7.1	455	13.5	69	11.7
Titanium	281	4.5	3270				230	12.1				4.0
Tungsten	1191	19.1	6152		500,000			51		31.0	33.1	2.2
Vanadium	380	6.0	3182									5.6
Zinc	447	7.14	786		20,000	60	35	18.5		30.0	34	18.0

* Elongation in 8 in.

Have You Considered the Possibilities of *Flame-Spinning?*



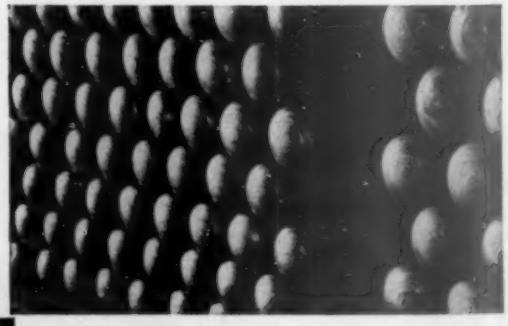
Oxy-acetylene flames heat the tubing to the proper forming temperature.

IT is a fast, inexpensive way to form tubular parts. Flame-spinning will partially close the ends of tubing . . . or make complete closures . . . or reduce diameters at any point. There is no limit to the diameter of tubing that may be flame-spun, provided the ratio of tube diameter to wall thickness does not exceed 50 to 1.

In the pictures, tubing 3 inches in diameter, made from 12-gage sheet, is being end-formed for use in chemical converters. It takes only 45 seconds to close each tube completely.

Ask a Linde representative to show you how you can use the flame-spinning process . . . or write for a copy of the folder, "Flame-Spinning Process," Form 5915.

The flames are withdrawn to allow the forming tool to shape the tube end.



The completely closed tubes are ready for installation in chemical converters.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 E. 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities

In Canada: Dominion Oxygen Company, Limited, Toronto

How a Thermit Weld is Made

Thermit welding was introduced more than 40 years ago. Now an accepted process—it is regarded as the standard method of joining very heavy sections and of welding rail on street railway systems. The Thermit process differs from other fusion welding methods in that it deposits in bulk—all at one time—a quantity of molten metal sufficient to complete the weld. This weld metal—known as Thermit steel—can be produced in varying compositions, making it possible—in most instances—to match the chemical and physical properties of the parts to be joined.

Thermit welding is made available in three ways: (1) it may be done by your own crew in your plant after instruction by one of our engineers; (2) parts can be shipped to us; or (3) we can do the work in your plant.

Contact our nearest office today and get the complete story on this time-and-expense-saving process. Metal & Thermit Corporation, 120 Broadway, New York 5, N. Y., Albany, Chicago, Pittsburgh, So. San Francisco, Toronto.

MAKING THE WELD

1. A mold box of sufficient size is constructed around the section to be welded. (The size of a Thermit weld is governed only by the limitations of mold construction.)

2. The parts to be welded are pre-heated to a red heat. During pre-heating a crucible is placed in position and filled with the desired Thermit mixture.

3. The mixture is ignited and the Thermit reaction takes place. In Fig. A, the reaction has occurred and the crucible is ready for tapping.

4. In Fig. B, the crucible is tapped, allowing the Thermit steel to fill the mold completely—thus preventing oxidation.

5. The pre-heated metal fuses with the fluid metal, Fig. C. Cooling takes place at a uniform rate throughout with only one shrinkage. Hence, serious internal stresses are eliminated.

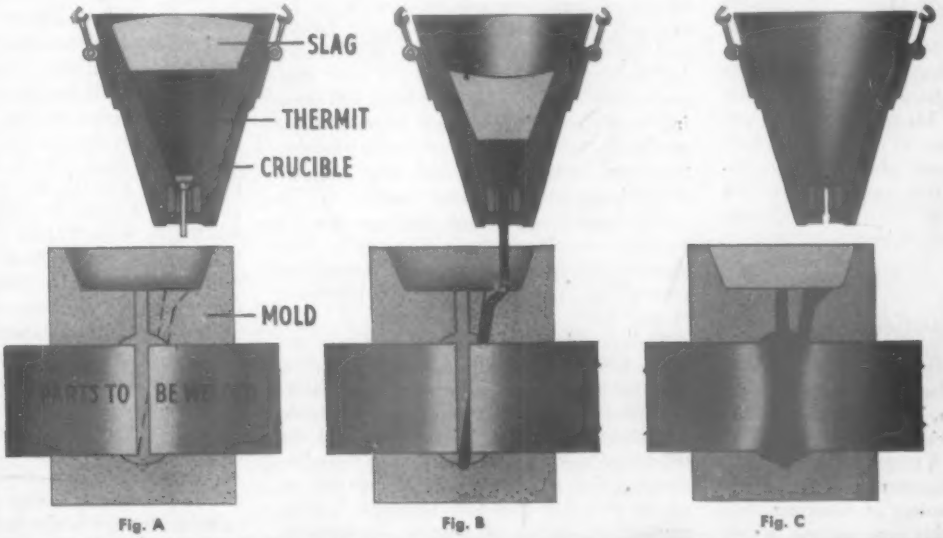


Fig. A Fig. B Fig. C

THERMIT WELDING

The Technical Slant

"I will study and read, and someday my time will come"—Abraham Lincoln

Electronic Controls

ELECTRONICS IN INDUSTRY. By George M. Chute. Published by McGraw-Hill Book Co., New York City, 1946. Cloth, 5½ x 8½ in., 461 pages. Price $5.

The author of "Electronic Control of Resistance Welding" has written a new volume that gives a broad introduction to the use of electronic circuits and equipment in industry. Mr. Chute's second book outlines the industrial uses of tube circuits and gives detailed explanations of a large number of electronic equipments now serving industrial plants. The subject matter, however, is presented primarily for the user of equipment already built rather than for the designer or builder of original electronic equipment.

In his opening chapter, the author assumes that his readers have no previous knowledge of electronic principles, circuits or tubes. Subsequent chapters introduce them gradually to the use of electronic tubes in simple operating circuits. In this manner, the reader is made acquainted with the purpose of electronic equipment before he is allowed to explore the nature of the tubes themselves. Later on, specific information is presented regarding resistance-welding controls, arc-welding controls and electronic controls for many other applications. A desirable feature of the book for many readers is that the problems presented may be solved with simple arithmetic.

The material in this volume is based on an evening study course taught by the author under sponsorship of the University of Michigan Extension Service. It supplements, rather than duplicates, the material on industrial electronics discussed in other texts by explaining many kinds of complete circuits. The volume aims to draw the reader's attention to the various phases of this important subject in order to encourage him to do other reading on the special subtopic that particularly interests him.

☆ ☆

Economics Simplified

EVERYDAY PROBLEMS IN ECONOMICS. By May Wood-Simon. Published by American Technical Society, Chicago, 1945. Cloth, 5½ x 8½ inches, 544 pages. Price $3.50.

Readers of THE WELDING ENGINEER, as producers and as consumers will be helped to a greater understanding of American economic problems by this new volume, which offers an excellent insight into the relations of present problems to the past and their possible effects on the future.

Everyday Problems in Economics treats the "dismal science" in a concise, clear and decidedly refreshing manner. The subject is approached from the wider viewpoint of the consumer rather than that of the producer. For this reason, the book is more than an introductory text to the study of economics. Not only does it probe and examine the nature of the basic economic and political institutions, but it also interprets them in the light of common contemporary problems.

The book opens with a historical background of our economic structure and then discusses The Consumer, His Desires and His Ability to Pay. Succeeding chapters investigate price determination, the national income and how it is distributed, the farm problem, labor problems, trade association activities, corporations and monopolies, public finance and "democratic" economic planning. Each chapter deals with a specific problem and begins with a preview of the salient facts to be covered. The problem is then analyzed step by step until the way becomes clear to the set of challenging text questions which conclude each chapter.

The volume has an extensive index and a directory of economic terms, the specialized meanings of which are not ordinarily found in an abridged dictionary.

☆ ☆

Bearing Engineering

BALL AND ROLLER ENGINEERING. By Arvid Palmgren. Published by SKF Industries, Inc., Philadelphia, 1945. Cloth, 6 x 9 inches, 270 pages. Price $3.

Dr. Palmgren, a well-known authority and winner of many engineering awards for his research in ball and roller bearing fatigue and the development of methods for calculating bearing life, has prepared a most comprehensive volume containing some 900 drawings and tables. This book begins with a technical description of common bearing types and continues through nine chapters of fundamental engineering studies.

Both radial and thrust bearings are discussed comprehensively in Chapter 1. This chapter also includes data on dimensional proportions, running accuracy and tolerances of each type.

The second chapter, devoted to forces and motions in bearings, discusses the theory of calculations on such subjects as the nature of rolling resistance, friction torque, friction coefficient, stress and deformation, load distribution, motion and inertia. Succeeding chapters deal with studies in the carrying capacity of roller and ball bearings, bearing application, design of bearing applications, mounting and dismounting, lubrication and maintenance, bearing failures. The final chapter is made up of tables, conversion values and a description of symbols and abbreviations.

This comprehensive volume is a must for all those involved in problems of bearing applications. The treatment is so thorough that little is left in the way of guess work. The volume is quite suited as a text on this particular engineering subject.

☆ ☆

Flow Meter Handbook

FLOW METER ENGINEERING HANDBOOK, second edition. By Louis Gess and R. D. Irwin, editors. Published by Brown Instrument Co., Philadelphia, 1946. Fabricoid, 7½ x 10 inches, 158 pages. Price $2.50.

A complete and concise treatment of fluid measurements, including related factors, equipment, equations and computations, will be found in this revised edition of the Flow Meter Handbook. The treatment covers steam, water, oil and gas flow.

The volume is divided into three sections, the first of which discusses principles of orifice meter measurement, the orifice plate and differential connections and design details of Brown flow meters.

The second phase includes formulas and tables related to flow meter problems such as flow approximation tables, derivations of working formulas, working equations, and data on the compressibility of gases, relationship between coefficient of discharge, viscosity of fluids, etc. Orifice calculations are detailed for steam, oil, water and gas flow. The final sections summarizes the information previously presented and gives equations and nomenclatures for corrections for operating conditions and volume computations.

The 158-page volume is profusely illustrated and contains 55 tables that are of considerable importance in the solution of flow meter problems.

☆ ☆

Manual on Labor Laws

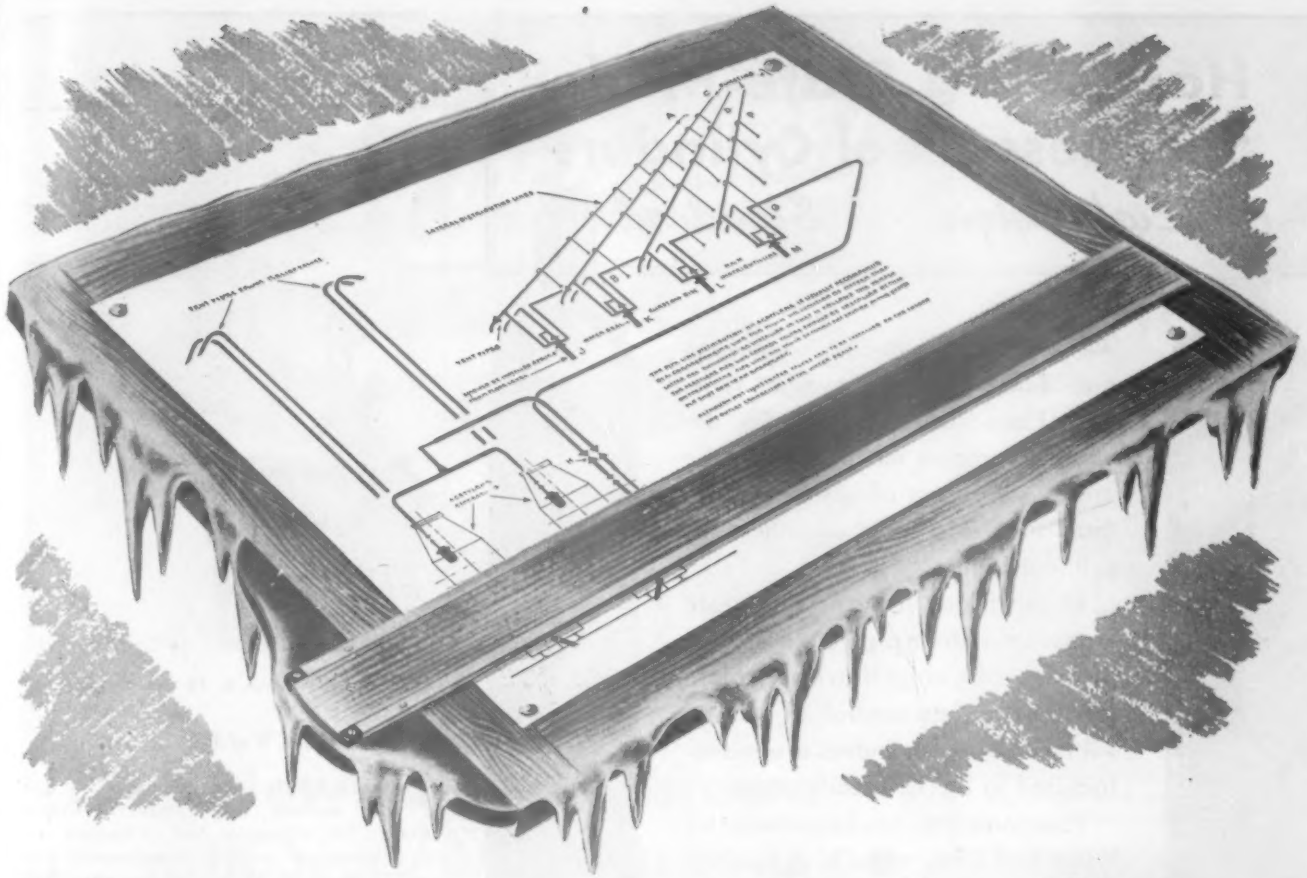
FEDERAL LABOR LAWS. Published by National Foreman's Institute, Deep River, Conn., 1946. Fabricoid, looseleaf, 6½ x 9½ in., 72 pages. Price $2.50.

This manual is for the foreman who is continually stumped by the growing mass of Federal labor legislation with which he is expected to deal. Here in one convenient volume he can find the important dos and don'ts about the Wagner Act, the Wage Hour Law, the Walsh-Healy Public Contract Act, Wage Stabilization, Social Security, U. S. Employment Service, Fair Employment Practice Committee and the Veterans' Administration.

This slim volume is streamlined in verbiage as well as appearance. The salient points of each law are presented concisely in simple non-legal language. The presentation is interpreted from the foreman's point of view, and wherever possible actual case histories are presented to show specific applications of the particular law being discussed. Another valuable feature is the fact that the manual is looseleaf, and inserts covering new labor laws or revisions to old ones will be available from the publisher to keep it up to date.

☆ ☆

"Debt is like any other trap, easy enough to get into, but hard enough to get out of."
—H. W. Shaw.



Before Your Oxyacetylene Pipe Line Plans

Are Frozen...

LET THESE TWO INVALUABLE BOOKS HELP YOU

From the moment you begin to visualize pipe line needs, Airco's book, "Planning Your Oxyacetylene Installation" will prove an immense aid. It was compiled by Airco technicians, who know from experience the problems that will confront you while planning your pipe lines. The writers point the way to save money and time . . . to avoid costly mistakes . . . to install a system planned to give long, economic service. They help you to plan now for an installation not only adequate for today's loads . . . but also capable of meeting greater demands when needed. You'll find this book invaluable. It anticipates your questions and arranges the answers so you can turn right to them.

Forty-two pages jam-packed with facts, figures and illustrations thoroughly covering your problems . . . yours for the asking.

You will also want to review the new Airco Catalog No. 30. It describes the complete Airco line of acetylene generators, gas distributing manifolds, station regulators, and special protective devices which are vital elements of a pipe line system. Fill in the coupon and mail to: Air Reduction, General Offices, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Co., General Offices, Houston 1, Texas. Represented Internationally by Airco Export Corporation.

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Harrisburg Plate-Made Seamless Steel Cylinders

Lightweight *Standard*

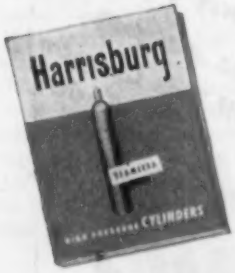
All Harrisburg Cylinders, whether of the Standard or Lightweight type, are "Plate-Made." This highly developed process makes certain the uniform thickness of walls and bottoms that is a safeguard against cylinder failure.

Rigid inspection and complete manufacture from pig iron to finished product in the large Harrisburg plant are an absolute control of quality. All Harrisburg Cylinders are manufactured to I. C. C. specifications.

Your complete requirements for all types and sizes, regular or special, can be procured from one source.

At the left is the Lightweight Chrome-Molybdenum Cylinder now available in 3 new sizes of 300, 350 and 400 cu. ft. for the storage and handling of industrial oxygen.

At the right is the Standard Manganese Cylinder. Millions of this type of Harrisburg Cylinders are in service wherever high pressure gases are used.



Send for this NEW High Pressure Cylinder Catalog!

The new Harrisburg Cylinder Catalog contains buying information on all types of cylinders. It describes the Plate-Made process, and export data has also been included.

We use the steel to suit the product . . . that's why Harrisburg is a by-word where quality is of highest importance.

HARRISBURG STEEL CORPORATION

HARRISBURG, PENNSYLVANIA

Alloy and Carbon Steels; Seamless Steel CO_2 Liquefiers, Pipe Couplings, Slush Pump Liners and High Pressure Gas Cylinders; Drop Forgings; Forged Steel Pipe Flanges; Coils and Bends

NEW PRODUCTS TO USE

(Continued from page 68)

Midget butt welders in 10 and 20 kva sizes

Midget Butt Welder

PARALLELING its midget 3 and 7½ kva spot welders, the UNIVERSAL WELDER CORP., 760 Carnegie Ave., Cleveland 15, has developed a new bench-model butt welder made in 10 and 20 kva sizes. This unit is available with either hand or air-operated clamps and push up features.

Air-operated machines are designed for butt welding of wire and steel rounds up to approximately ¼ in. steel. They may be used to fabricate small steel moulding strip, bicycle wheel rims, etc. A foot switch starts the cycle by clamping the weldment, and heating, welding, push up and release of the welded part follow automatically.

The hand operated machine is capable of producing intermittent butt welds in steel rounds up to ½ in. (or larger for infrequent welds).

☆ ☆

Rectifier Tube

A 10½-in., temperature-free, grid-control rectifier tube has been developed for such applications as welding control, power rectifiers and vibration motors. This xenon-filled tube (type C16J) is said to be ideal for smooth stepless electronic motor speed controls. ELECTRONS, INC., 127 Sussex Ave., Newark 4.

☆ ☆

Electrode for Monel Metal

LATEST addition to the Arcos line of electrodes for welding nickel and nickel-copper alloys is a d-c, reverse-polarity electrode, "Monend," to be used for welding wrought, cast, or clad Monel. The company also manufactures "Nickelend" electrodes for welding nickel and "Nicuend" for welding cupro-nickel. ARCOS CORP., 312 Gulf Bldg., Philadelphia 2.

The GOGGLE welders asked for is HERE!

1. Goggle in regular welding position

2. Pull outward and upward with either hand

3. Goggle rests on forehead during layout or inspection of work

The New CESCO Aristocrat with *Speed-Shift* Suspension

HERE IT IS! The CESCO Aristocrat Welders Goggle—with patented coil-spring suspension. A quick flip moves the goggle onto the forehead or back into position. Saves time! Promotes efficiency!

That's not all—this goggle increases welders' comfort too. The spring action is mild enough to eliminate pressure. The cups rest comfortably, and are adjustable to individual facial requirements. The headgear is made of lightweight, flexible, form-fitting plastic, and is easily adjusted to any head size.

***WRITE** for literature and prices.*
For quick delivery, get your order in soon.

This CESCO *Air-Flow* Helmet is proving its worth to welders

CESCO'S recent development—the *Air-Flow* Welding Helmet—is consistently proving to be a remarkable success. Its superior, exclusive method of air feeding disperses fumes and heat—reduces fatigue, increases production. It combines assured welding safety and "air-conditioned" comfort. For complete information write for BULLETIN B.

CHICAGO EYE SHIELD COMPANY
2330 Warren Boulevard • Chicago 12, Illinois

CESCO

CESCO FOR SAFETY

G·R

announces two new

FARM WELDERS

KNOWLEDGE gained from actual experience in furnishing welders for farm and ranch use since 1938 has been well used in the design of Models 130 and 180 limited-input type G-R Farm Welders. These new units are designed specifically for use on rural power lines, and do not supersede present G-R general-purpose and industrial models.

Models 130 and 180 are Underwriter's approved and are built in accordance with NEMA standards for welders of this type. Important features include:

● Power Factor Correction
reduces input yet provides the maximum welding current at correct arc voltage. Model 130 delivers a full 130 amps @ 25 volts, yet draws only 27 amps @ 230 v.; Model 180 has a top output of 180 amps @ 25 v., with maximum input of 37 amps @ 230 v. Limited input assures satisfactory operation on rural power lines.

● "Stepless" Control
Simplicity of operation is an important feature. G-R provides it with full-range heat control without taps or switches, and with a stable, smooth arc easy to handle in all positions.

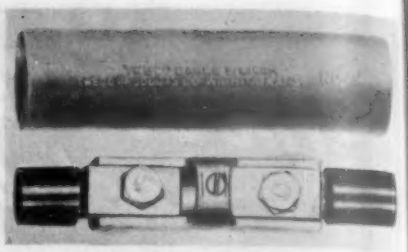
● Complete Equipment
is supplied — primary and welding cables, holder, helmet and rod samples. Farmers dislike buying "extras."

● Welding Manual
arranged in well-illustrated progressive lessons, is furnished with each G-R. Farmers like its easily-followed, practical instructions.

For full information, wire or write

GLENN-ROBERTS COMPANY

2107 ADAMS STREET • INDIANAPOLIS 1, INDIANA
3100 E. TENTH STREET • OAKLAND 1, CALIFORNIA

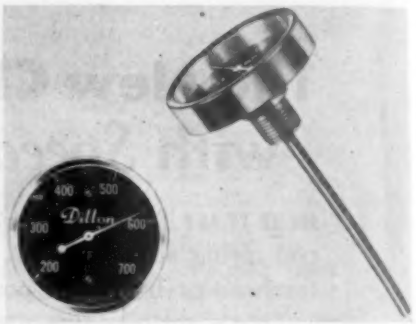


Tweco cable splicer with fibre cover removed

Cable Splicers

THE development of a new copper-alloy cable splicer does away with the soldering of bolting lugs onto broken or short cable lengths. The ends to be joined are secured by bolt clamps on each end of the splicer and covered by a heavy fibre sleeve. The splicer is made in three sizes to cover the full range of welding cables: Size "S" for small No. 6, 4, 2, or 1 cables; size "M" for medium No. 1, 1/0 or 2/0 cables; size "L" for large 3/0 and 4/0 cables. TWECO PRODUCTS CO., English at Ida, Witchita 7, Kan.

☆ ☆



Metal thermometer for temperatures from 150 to 750 F. Centigrade dials are available

Metal Thermometer

AN ALL-WELDED stainless-steel metal thermometer having a range of from 150 to 750 F is suitable for measuring temperatures of liquids such as oil when used for preheating or quenching. The stem fits into tight spots and is available in 5 or 9 in. lengths. A 2-in. immersion is required for liquids, 4 in. for gases. W. C. DILLON & CO., INC., 5410 W. Harrison St., Chicago 44.

☆ ☆

All-Position Electrode

"AP" is the name of a new E-6010 electrode for such jobs as tack welding, pipe welding, construction work and industrial fabrication where good out-of-position welds are required. "AP" produces a fine spray-like arc, and its deep-penetration qualities assure lasting bonds of X-ray perfection, manufacturer states. Slag is easily removed, and splatter loss is low.

The $\frac{1}{16}$-in. size of this electrode can be used in place of $\frac{5}{32}$ in. on all types of joints, eliminating the need to change electrodes when switching from downhand to overhead or vertical work. HARNISCHFEGER CORP., 4400 W. National Ave., Milwaukee 14.

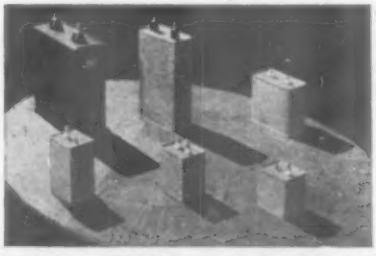
"Bingo" tips fit over a standard welding tip as shown for soldering applications

Soldering Kit

A HANDY new soldering tip kit, the "Bingo," is now available. It consists of two interchangeable tips, one for light work, one for heavy. The soldering tip slips over a standard welding torch tip, uses acetylene gas only. This outfit effectively handles silver and all other types of solder, manufacturer states. BEAVERDELL CO., 817 Webster Ave., Chicago 14.

☆ ☆

A NEW line of small, lightweight, d-c capacitors is announced by General Electric for application to light-metal welders and similar applications requiring economical energy storage and fast discharge. The "Pyranol" capacitors are available in a wide range of ratings, with ambient-temperature-operating limits at rated voltage ranging from 0 to 50 C and capacitance tolerances at 25 deg ± 10%. GENERAL ELECTRIC CO., Schenectady 5, N. Y.



"Pyranol" capacitors for light-metal welders

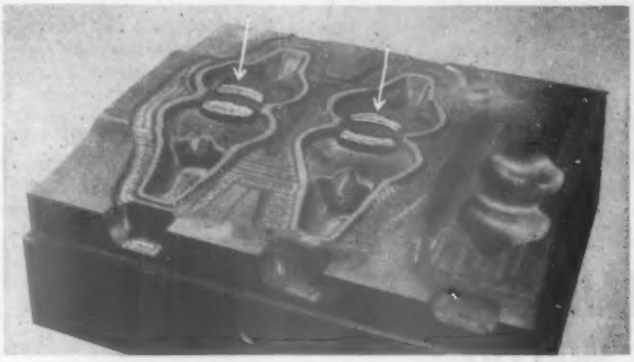
☆ ☆

Horizontal Grinders

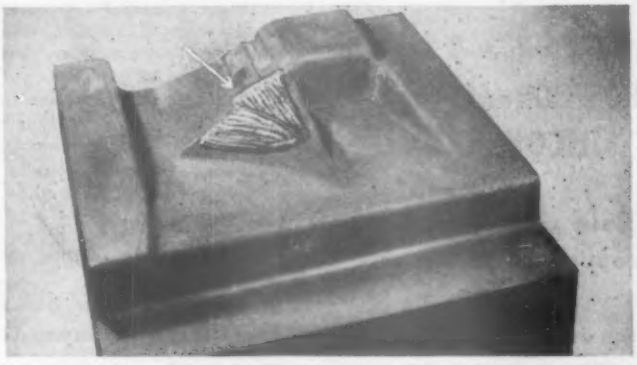
A NEW line of lighter weight "Master Power" horizontal grinders for weld grinding and similar purposes is announced by MASTER PNEUMATIC TOOL CO., INC., 2100 Keith Bldg., Cleveland. Features are magnesium housings and the use of hard chrome on the main wearing parts. The manufactured models are: M604 and M605 (4 in.); M606 and M607 (6 in. heavy-duty); M608 and M609 (8 in.) and M610 and M611 (6 in. light-duty).

Model M604, 4-in. grinder for steel welds

Do you know that the life of your forging dies can be extended?



Typical repair to forging die with Eureka "Drawalloy" electrodes.



Plow-share forging die refaced with Eureka "Drawalloy" electrodes.

Save tons of forging dies and untold man-hours by eliminating resinking operations! Eureka "Drawalloy" welding electrodes do the trick by *rebuilding to original dimensions* the contours of forging dies that have heat-checked or spalled!

You can efficiently rebuild defective forging dies with "Drawalloy" electrodes and *welded deposits will match the characteristics of typical forging block steel!* Welded and adjacent areas can be machined to the original dimensions of the die! Also effectively used for die repair. Send today for full descriptive literature. No obligation.

Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN

AGILE
Bronze
ELECTRODES

FOR
MAINTENANCE
WELDING
OF
COPPER • BRASS
PHOSPHOR • ALUMINUM
& SILICON BRONZES

This electrode has a copper, tin, phosphor alloy core wire and when coated with AGILE'S BRONZE coating is an outstanding rod for welding brass, phosphor, aluminum and silicon bronzes. The welding of steel and cast iron with bronze gives remarkable strength.

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Free catalog today!

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CORPORATION
5806 HOUGH AVENUE
CLEVELAND 3, OHIO

News of the Industry

Study German Use of Cerium

FORMATION of a two-man investigating team to study the German production and use of heat-resistant cerium alloys was announced last month by the Technical Intelligence Branch, Department of Commerce. The members of the team are John A. Livingston, president of the Cerium Metals Corp., N. Y., and Henry Kent, partner in the Kent Metal and Chemical Works, Edgewater, N. J.

According to Mr. Livingston, German engineers have achieved 20% higher extraction of this hard-to-handle metal from monazite sand than is possible with methods now known in the United States. They have also developed techniques for working cerium in powder form.

The chief uses of this rare-earth metal are: (1) as an igniter in torches for oxy-acetylene welding, in flints for cigarette lighters and in miners' head lamps, (2) to produce steel alloys and aluminum and magnesium alloy castings for jet plane gas turbines, aircraft supercharger parts and other equipment demanding great tensile strength at high temperature; and (3) to produce a more perfect vacuum in electronic tubes by absorbing the oxygen remaining in the glass after the tube has been sealed.

☆ ☆

Alcoa Plans New $30,000,000 Plant for Aluminum Rolling

PLANS for the construction of a $30,000,000 plant near Davenport, Ia., for the rolling of aluminum sheet and plate were recently announced by Aluminum Company of America. Occupying a projected 43 acres of floor space, the new plant will have the capacity to produce more than ten million lb of sheet and plate per month. It will be capable of turning out wider aluminum sheets than any other rolling mill in the world, and will also be able to produce the largest aluminum ingots manufactured.

Construction is scheduled to begin as soon as the project has been approved by the Civilian Production Administration. Completion of the plant will require about 18 months.

☆ ☆

Treasury Launches Peacetime Bond Campaign

THE U. S. Savings Bond Division emphasized self-interest rather than patriotism in its first peacetime savings bond campaign. The chief purpose of the current drive is not simply to sell more bonds but rather to impress upon the public the importance of systematic saving. With price control in jeopardy and goods scarce, the Government is attempting to head off inflation by urging a restraint of spending. A substantial investment in U. S. bonds by the public will tend to cut down the volume of idle money and bank deposits which constitute a growing menace to the price structure.

☆ ☆

DAV Establishes Job Matching System

BASED on a nation-wide study of capabilities of disabled veterans, the national Employment Officer of the Disabled American Veterans, has established a "Man-Job Matching Technique" that consists of: (1) making a physical demands analysis of a particular job, (2) making an analysis of the remaining physical abilities of a disabled veteran and (3) matching the veteran and job requirements so as to place the handicapped veteran in a job wherein his disabilities play no part in his job performance.

U. S. Bureau of Labor statistics tend to show that a disabled veteran, when properly placed, is more reliable and stable than the majority of able-bodied workers.

☆ ☆

Schedule Steel Show October 1 to 5

THE Iron and Steel Exposition sponsored by the Association of Iron and Steel Engineers will be held concurrently with the AISE annual convention in Cleveland's public auditorium, Oct. 1 to 4 inclusive. The show will feature exhibits of over 150 manufacturers, and an attendance of over 12,000 engineering, operating and supervisory personnel is anticipated.

Technical papers on various phases of plant operation and practice will be presented by engineering and operation authorities.

☆ ☆

Lukens Opens Cleveland Office

LUKENS STEEL Co. and its subsidiary, By-Products Steel Corp., recently opened a branch sales office at 1201 Citizens Building, Cleveland 14. The office will handle the territory formerly served by J. F. Corlett & Co., sales representative.

☆ ☆

Ryan Establishes Eastern Metal Division

RYAN Aeronautical Co., San Diego, Calif., has opened a metal products division in Washington, D. C., to handle sales and service of its exhaust manifold systems and new non-aeronautical products. The new section will occupy offices at 516 Bond Building.

CALLINITE: the perfect tip facing for perfect spot welds

Electrode tips, faced with Callinite, last longer between cleanings. Operators can weld many more inspection-standard welds without taking time out to dress tips, reset machines, or run frequent sheer tests. Less dressings mean less variations — hence a greater gain in welding output.

Callinite resists severe electrical and mechanical wear — and can pass heavy currents without overheating, sticking, or fusing when the current is interrupted. It is a special composition developed by Callite in three types for specific industrial applications.

TYPE TC tungsten-copper alloy for heavy duty resistance welding.

TYPE ST tungsten-silver alloy for high current and high frequency circuits.

TYPE SM a new silver-molybdenum alloy, for facing contact surfaces in heavy current switchgear.

Take a tip from leading manufacturers and engineers — specify Callinite facing material alloys for longer lasting, more efficient industrial products. Write for Callinite Bulletin No. 158 to: Callite Tungsten Corporation, 549 Thirty-ninth Street, Union City, New Jersey. Branch Office: Chicago, Cleveland.

CALLITE TUNGSTEN CORPORATION CT

Callite CONTACTS

Standard or special shapes in tungsten, molybdenum, silver, platinum, palladium, and alloys of these metals. Calliflex Thermostatic Bi-Metals.

PIONEERS IN TUNGSTEN METALLURGY FOR OVER 26 YEARS

2 new GREYHOUND

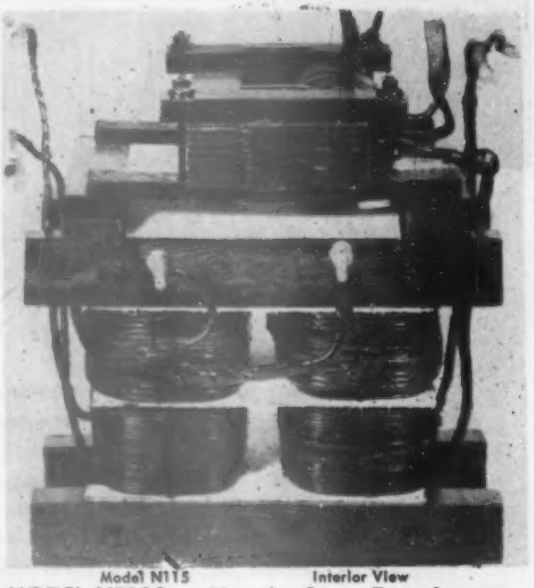
FARM and SERVICE STATION PORTABLE A. C. WELDERS

Built-in Capacitor for High Power Factor Correction — Meets R.E.A. Requirements — Also Reduces Power Bills and Installation Costs

Model N115 Exterior View

☆ ☆

Model N115—Has a New Power Packed Multiple-Coil Transformer, Features 4 Coils Instead of 2. Also Separate Reactance, Double-Woven Spun-Glass Insulated Magnet Wire. 15 to 115 Amperes.



Model N115 Interior View

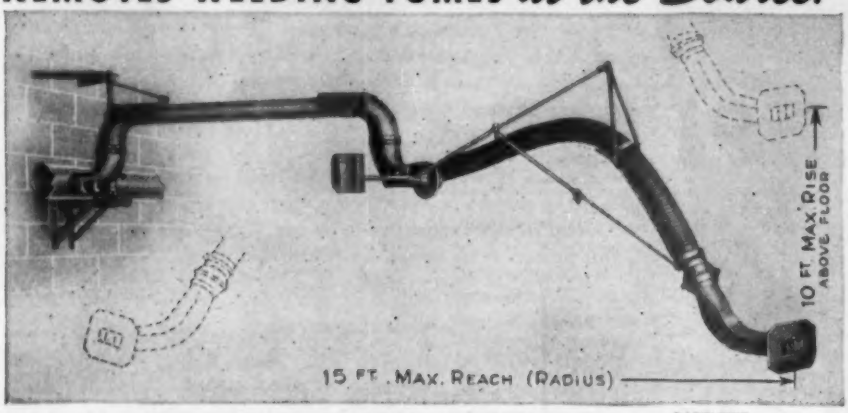
MODEL NF180 — Has the Same Transformer as our World Famous Variable Core Type Heavy-Duty Industrial Models with Handwheel Stepless Amperage Control. Double-Woven Spun-Glass Insulated Magnet Wire. 20 to 180 Amperes.

Write for Details — **ALSO HEAVY-DUTY INDUSTRIAL MODELS**
Territories Available for Distributors

GREYHOUND A. C. ARC WELDER CORP.
Manufacturers
604-606 Johnson Ave., Brooklyn 6, N. Y.

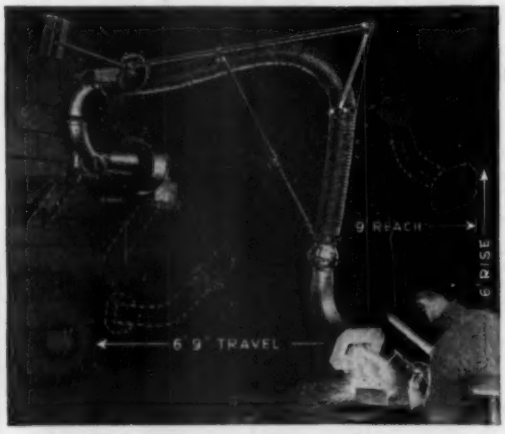
RUEMELIN Fume Collector

REMOVES WELDING FUMES *at the Source!*



PATENTED

LONG REACH MODEL D-5342 — Ideal for large welding booths. Hood reaches out 15 feet from wall. Swivel joints permit inlet hood to revolve in 360° circle for access to all welding positions. Recommended for welding shops having a wide variety of work.



STANDARD MODEL D-5310

Used for standard welding booth ventilation. Hood reaches out 9 feet from wall. A real necessity, especially during winter months when doors and windows are closed.

PATENTED

● Install Ruemelin Fume Collectors to solve your fume removal problem in the most satisfactory manner. Noxious gases, smoke and fumes are drawn away *at the source.* Check these exclusive features:

1. **Guards employee's health against fumes — less welder fatigue.**
2. **Clears shop air with minimum building heat loss.**
3. **Exhaust hood instantly positioned, without using troublesome devices.**
4. **Hood covers maximum welding area, vertically, horizontally and by circle swing.**
5. **Hood equipped with swivelling ball-joint.**
6. **Small amount of electric power used.**

Thousands in daily service in progressive welding shops, metal working plants, railroad repair shops, foundries, structural steel plants, etc. Repeat orders received from many satisfied users. Collectors are available with individual exhaust fans, or with one large fan for multiple collector installations. Engineering data and directions for installing, furnished with each order. Write for Bulletin 37-C and prices.

RUEMELIN MFG. CO.

3880 NORTH PALMER STREET — MILWAUKEE 12, WISCONSIN, U. S. A.

MANUFACTURERS AND ENGINEERS

SAND BLAST AND DUST COLLECTING EQUIPMENT

A 4931-2/3

Nelson Sales Appoints Six New Field Engineers

NELSON SALES CORP., Lorain, O., distributor for Nelson welding equipment and studs, has appointed six new field engineers. Richard O. Blankmeyer, located at 211 Ledyard Drive, Fayetteville, N. Y. will cover upstate New York and northern Pennsylvania. Kenneth Knotts, suite 235, Executive Floor, William Penn Hotel, Pittsburgh, will serve western Pennsylvania, southeastern Ohio, western Maryland and West Virginia. Leslie E. Bluhm, 7762 Emerson Rd., West Lanham Hills, Hyattsville, Md., will handle the Delaware, eastern Maryland, Washington, D. C., Virginia and North Carolina area. Al Wrigley and Jack Godley handle the Detroit area jointly, both being located at 2970 West Grand Blvd., Detroit. Mr. Wrigley will also cover northeastern Michigan, and Mr. Godley will cover northwestern Ohio and Fort Wayne, Ind.

☆ ☆

Merger of Two Budd Firms Creates $80,000,000 Corp.

AN $80,000,000 corporation known as The Budd Company has resulted from the merger of the Edward G. Budd Manufacturing Company and the Budd Wheel Co., both of Pennsylvania. The new firm will own all assets and business and will be subject to all liabilities of the two former companies. The Budd Company will now be operated in four principal divisions, automobile, body, railway, wheel and induction heating. Plants employing a combined working force of 15,000 are located in Detroit and Philadelphia.

☆ ☆

Small Manufacturers Join to Protect Patent System

SEVEN representatives of smaller manufacturers have been elected to serve as governors of the National Patent Council and to lead a nationwide educational program in defense of the patent system. The new governors are: Henry K. Norton, treasurer, Walter Kidde & Co., New York City; Melvin M. Johnson, Jr., president, Johnson Automatics, Inc., Boston; E. A. Terrell, president, Terrell Machine Co., Charlotte, N. C.; Phil T. Sprague, president, The Hays Corp., Michigan City, Ind.; W. L. McKnight, president, Minnesota Mining and Mfg. Co., St. Paul; C. B. Hasford, president, L.P.G. Equipment Corp., Dallas; and Jay C. Perrin, president, Towlsaver, Inc., Los Angeles.

☆ ☆

Chemical Show to Run with ACS Semi-Annual Meeting

CHICAGO'S Coliseum will house the fourth National Chemical Exposition in conjunction with the semi-annual meeting of the American Chemical Society. The meeting will begin Sept. 9 and run from Sept 9 to 13, and the show from Sept. 10 to 14. Marcus W. Hinson, director of the exhibition, states that more than 80,000 sq ft of floor space will be made available for displays of chemical products and processes.

Welded Radio Tower Planned By Chicago Television Station

BALABAN & KATZ, operators of television station WBKB, Chicago, have made plans for a 685-ft FM tower of welded steel construction. It will be anchored on bed rock about 90 ft below the ground and rise 600 ft in the air before being topped by an 85 ft-antenna.

Location of the tower, transmitter and television theater building will be at 212-216 N. State St., Chicago.

☆ ☆

Germans Develop New Type Soldering Iron

A COMBINATION gasoline torch and soldering iron developed by German industry has the fuel tank (containing the pump) form the handle of the torch. A sheet-metal guard concentrates the heat on the soldering copper, which is fastened to the top of the torch and held in the flame. Without the soldering iron attachment, this German tool becomes a good torch with one-half pint fuel capacity. For further information write: Office of the Publication Board, Department of Commerce, Washington 25, D. C. (PB-11497; photostats, $1; microfilm, 50c; 3 illustrated pages).

☆ ☆

Ryan Awarded $200,000 Contract

COLLECTOR rings and allied exhaust system accessories for Consolidated-Vultee's twin-engine 240 airliners will soon be provided by the metal products division of the Ryan Aeronautical Co., San Diego. The $200,000 contract is based on requirements for more than 100 airliners which have been contracted for American Airlines and Western Air Lines. It is estimated that other airlines will soon order 240s from Convair, increasing the initial order considerably.

☆ ☆

Progressive Welder Vacations Aug. 5 to 18

EMPLOYEES of the Progressive Welder Co., Detroit, will take all of their vacations in the period beginning Aug. 5 and continuing through Aug. 17. This policy has been adopted to maintain the greatest production efficiency during the summer months. During the two weeks, offices will be open to receive material, and the company will have a skeleton crew of sales engineers and service men on hand to take care of emergency calls.

☆ ☆

Kaiser Ships Steel for California

AMERICA'S desperate need for cars has caused the Kaiser-Frazer Corp. to ship steel from the Kaiser Fontana, Calif., plant to midwest steel centers for processing into automobile sheets. This has been accomplished by extra production at Fontana, Kaiser-Frazer will also purchase an interest in a new steel company which will take over existing facilities of a midwest plant of large productive capacity. Details will be announced later.

WELDING
MODERN STEELS
BY
MODERN METHODS
DEMANDS
INDUCTION HEATING

60 KVA Model BH Induction Heater with Full Heat Cycle Program Control and 6 Point Recorder

FOR PRECISION CONTROL OF
HEAT!

INDUCTION HEATING by the **SMITH DOLAN SYSTEM**
Plus The New **HEAT CYCLE PROGRAM CONTROL**
Gives all this and more.—Precision control of **PREHEATING FOR WELDING** and **NORMALIZING AFTER WELDING** is the only efficient method for joining modern alloy steels.

MODERN—SELF-OPERATING—COMPLETE!

Once the metallurgical heat-cycle for the steel has been determined, it is only necessary to set the controls, and the machine shown above will deliver this program from start to finish! In addition, recorded charts keep permanent records for duplication of results. A complete unit for efficient performance. Temperatures up to 1750° F. readily obtainable.

ELECTRIC ARC, Inc.

152-158 Jelliff Ave. Newark 8, New Jersey

Porter-Cable Distributes Profit-Sharing Checks

INDIVIDUAL checks averaging $246 were recently distributed to employees of the Porter-Cable Machine Co., Syracuse, N. Y., manufacturer of abrasive-belt grinders, under a profit-sharing plan. This distribution of 1945 profits was based on an amount equivalent to the approximate monthly earnings of each individual.

☆ ☆

National Tube Buys Wartime Gary Facilities

THE National Tube Co. has purchased from the Reconstruction Finance Corp. for $4,775,000 a portion of the wartime facilities installed by the Government in the company's Gary plant. During the war, the plant manufactured millions of feet of seamless alloy tubing for aircraft, tanks, refineries, ships, etc.

☆ ☆

Scotch Firm Licensed to Manufacture Cor-Ten

COLVILLE, LTD., Glasgow, Scotland, has been licensed by Carnegie-Illinois Steel Corp. to manufacture "Cor-Ten," a corrosion-resistant, low-alloy steel.

• Marquette's outstanding new transformer design gives you INSTANT ARC Striking without extra high frequency or booster gadgets. Model 262 C has a High Power Factor of 95%. Telnic Bronze plugs and sockets double current carrying capacity. Its wide range of 20 to 275 amperes takes all welding jobs in stride from light sheet metal to heavy steel beams . . . from maintenance to high-speed production welding. Models: 262 C and 262, 20-275 amps.; 261 C and 261, 20-200 amps. Write today for literature on these superb Marquette Welders.

MARQUETTE WELDING EQUIPMENT SOLD EXCLUSIVELY THROUGH THE NATION'S LEADING DISTRIBUTORS

MARQUETTE
REGISTERED U.S. PAT. OFFICE
Welding EQUIPMENT
A.C. ARC WELDERS · ELECTRODES
GAS WELDING And CUTTING EQUIPMENT
ACETYLENE GENERATORS · ACCESSORIES
MARQUETTE MFG. CO. INC.
MINNEAPOLIS 14, MINN.

Courtesy, American Manganese Steel Division

"I think they're hinting about converting us back to the kitchen. The chief had me welding a handle on his wife's egg-beater today!"

☆ ☆

O.K. Stamping Corp. to Do Sheet-Metal Work

O.K. STAMPING Corp. recently organized in Fort Wayne, Ind., will do contract work in metal stamping and production. Principals in the new corporation are F. A. McGuire and J. P. McGuire, owners of the O.K. Machine Co., an associated concern, and H. J. Cocks, general manager. Mr. Cocks was a partner in the former Morco Mfg. Co., from which the O.K. Stamping has purchased its building.

The combined production facilities of the two companies include a complete line of spot and projection welders up to 100 kva, punch presses up to 400 tons maximum, gas and electric heat-treating furnaces, shears, slitters, flat edge trimmers, etc. All types of operation will be done on metal stampings up to ¼ in. thickness.

☆ ☆

Square D Expands for Reconversion

TO MEET the rapid growth of industry on the West Coast, the Square D Co., Detroit and Milwaukee, will build a new Los Angeles plant to replace the one now in operation at 1320 East 16th Street.

☆ ☆

Cinch Purchases Howard B. Jones Plant

CINCH Manufacturing Corp., producers of electrical connecting devices, has purchased the Howard B. Jones plant. All Jones items will continue to be made at the Jones plant and will be known as the Howard B. Jones Division.

☆ ☆

Moves to New Plant

NATIONAL Time & Signal Corp. has moved to its new plant at 21800 Wyoming Ave., Detroit 20.

About People

RICHARD D. PETERSON, formerly assistant sales manager for Solar Aircraft, has been appointed sales engineer and consultant for the new eastern metal division of Ryan Aeronautical Co., San Diego. JAMES STAINER, exhaust engineer from the west coast plant has been assigned as the eastern area engineering representative. E. R. SCROGGIE has been named aircraft representative. He will handle matters relating to the company's aircraft manufacturing contracts with government agencies.

☆ ☆

GUY M. STONE has been appointed manager of the Coshocton plastics plant for General Electric Co. The plant is now under construction. GEORGE P. LEHMAN has been appointed assistant manager of all plastics divisions and DAVID FITZGERALD as manager of employee relations for the same. Mr. Fitzgerald will be responsible for coördination of employment and rates, and will represent the divisions on all matters pertaining to collective bargaining agreements.

☆ ☆

DR. DAVID S. SAXON has joined the research staff of Philips laboratories of North American Philips Co., Inc. as an associate physicist. He is in charge of the section on theoretical physics. At present Dr. Saxon is working on the theory of the stability of high energy particle accelerators such as the synchrotron and frequency modulated cyclotron.

☆ ☆

HERBERT T. FLORENCE has been elected president and general manager of The Cleveland Crane & Engineering Co., Wickliffe, O. He has been general manager of the company since 1941. Other executive appointments include A. C. GARNETT as vice-president and treasurer, W. G. WEHR, secretary and W. D. VANDERBILT, assistant secretary.

☆ ☆

LESLIE E. BLUHM, formerly with the welding and casting section, bureau of ships, Navy Department, has joined the Nelson Sales Corp., Lorain, O., as field engineer. One of Mr. Bluhm's war-time assignments was the development of stud welding applications in naval construction.

☆ ☆

GEORGE P. TORRENCE has rejoined the Link-Belt Co. as executive vice-president, and will become president of the company Nov. 1, 1946. At this time W. C. CARTER will retire as president, in accord with the company's retirement plan.

GEORGE HAJEK has been appointed manager of the Dallas, Tex., sales district for Ceco Steel Products Corp. JOHN W. ANDERSON has been named to manage the firm's Oklahoma City sales district. He succeeds R. K. ALEXANDER, who has been placed in charge of Ceco's sales office and warehouse in Houston.

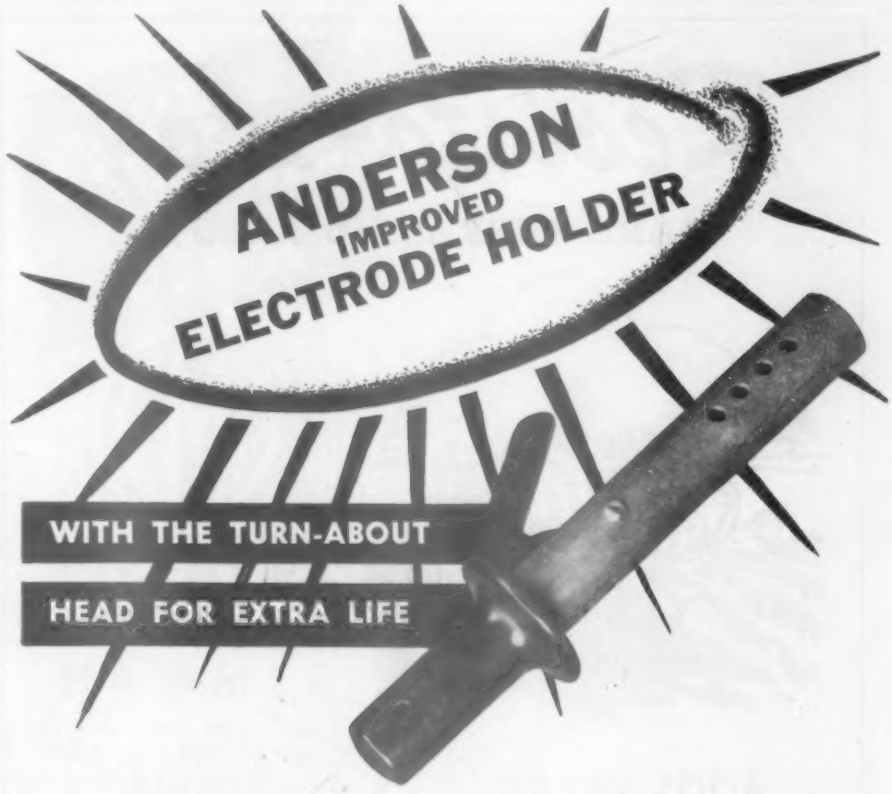
☆ ☆

J. F. WELLER has been appointed to the newly created post of sales assistant to the president of American Brake Shoe Co., N. Y. He will represent the entire company in his new position by promoting sales for all divisions of the organization.

HOWARD J. MULLIN has been appointed manager of the St. Louis Sales district for Carnegie-Illinois Steel Corp. He succeeds ROBERT J. KORSAN, JR., retired. Mr. Korsan was recently awarded the gold Gary service medal in recognition of 50 years continuous service with the U. S. Steel Corp.

☆ ☆

WALKER PENFIELD has been appointed manager of manufacturing for the Pennsylvania Salt Mfg. Co. CLAUDE S. BELDIN has been named for the newly created position of production manager. HENRY G. MEYER, formerly assistant to the works manager, has been appointed Mr. Beldin's assistant.



The new ANDERSON Light-Weight Electrode Holder with the cool handle leads a double life. A single screw is loosened to allow reversal of the insulated head — the head lasts twice as long . . . expense of replacement is cut in half.

A vise-jaw grip, fully protected from spatter, firmly holds up to ¼ inch electrodes. Good balance and a weight of only one pound is achieved by simplicity of construction and a minimum number of parts. A single screw holds it together. Don't let inferior equipment slow you down . . . insist on ANDERSON.

Write today for further information and prices.

DISTRIBUTORS IN PRINCIPAL CITIES

ALBERT & J. M. ANDERSON MFG. CO.
305 A STREET BOSTON 10, MASS.

ROBERT T. PURSELL, formerly welding engineer for the Worthington Pump and Machinery Co., has joined the Charles W. Krieg Co., Newark. He will serve in the capacity as consultant to the company in its activities. Mr. Pursell is chairman of the New Jersey section of the American Welding Society.

☆ ☆

JAMES M. UNDERWOOD has been elected president of Vulcan Mold & Iron Co., Latrobe, Pa. He succeeds EDWARD R. WILLIAMS, resigned. His immediate objective will be to consolidate and expand the company's position as a producer of quality ingot molds for the nation's steel industry.

ROBERT R. PIERCE of the technical service department of the Pennsylvania Salt Mfg. Co., Washington, has been appointed sales service representative of the Pennsalt parent company's special chemicals division. Mr. Pierce will cover the Washington-Oregon-Idaho-Montana area. He will handle all products of the special chemicals division, including industrial cleaners and pickling and descaling products.

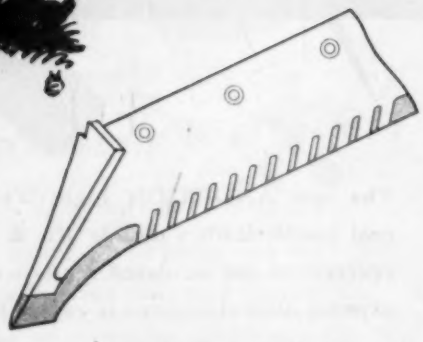
☆ ☆

J. A. GULICK has been appointed sales representative for Titan Metal Mfg. Co., Bellefonte, Pa. His territory will include Oklahoma, Arkansas and northwestern Texas, with offices at 310 Thompson Building, Tulsa.

Resisto-Loy

HARD-SURFACING ALLOY

ADDS YEARS OF WEAR — to



Plow Points · Plow Shares · Separator Cylinder Teeth · Disc Plows and Harrows · Feed Mill Hammers

Application of Resisto-Loy and Isorod alloys keeps teeth and points sharp. Doubles and triples the length of service. Tough—will not chip. These alloys have a wide range of applications in hundreds of industries—wherever iron and steel has to withstand terrific *impact, abrasion* and *corrosion*.

RESISTO-LOY CO., GRAND RAPIDS 7, MICH.

HAROLD L. GEIGER, head of the Chicago technical section of the development and research division of The International Nickel Co., Inc., has been elected chairman of the Chicago chapter of the American Society of Metals.

☆ ☆

ROBERT J. ANDERSON has been appointed assistant manager of the Ford Motor Company's Charlotte, N. C. branch. ERNEST R. BREECH, formerly president of the Bendix Aviation Corp., has been elected a director of the company and executive vice-president.

☆ ☆

C. R. STANDEN, formerly associated with the RCA victor division of Radio Corp. of America, has been appointed advertising manager of Ladish Drop Forge Co., Cudahy, Wis.

☆ ☆

ROBERT H. MCCRACKEN has been named sales manager of the new branch office of Lukens Steel Co. and its subsidiary, By-Products Steel Corp. The new office is located at 1201 Citizens Bldg., Cleveland 14.

☆ ☆

J. L. KLEIN, formerly with Eastern Research Laboratory, Crucible Steel Co., has been appointed director of research of the Jessop Steel Co., Washington, Pa., manufacturer of electric melted specialty steels.

☆ ☆

KENNETH P. SCHORY has been appointed executive designer for Product Designers, Chicago. Mr. Schory's design experience covers a wide range of product styling including industrial equipment, airplane interiors, etc.

☆ ☆

LLOYD C. SMITH has been promoted to vice-president and general manager of Heller Brothers Co., Newcomerstown, O. Mr. Smith will be in charge of the production of all company products.

☆ ☆

GEORGE F. FERRY has returned to Carnegie-Illinois Steel Corp. as superintendent of standard structural mills at the south Chicago plant after five years of military service.

☆ ☆

GORDON E. BROWN has been transferred to the Hartford district as field engineer for Ampco Metal, Inc. He will sell Ampco products throughout New England.

☆ ☆

ALFRED B. DRASTRUP has been appointed manager of the alloy steel sales department of A. M. Byers Co., Pittsburgh.

T. E. MOFFITT has been named sales manager of the Pennsylvania Salt Mfg. Co. of Washington, a subsidiary of the Pennsalt Co. Mr. Moffitt will be in charge of all heavy chemical sales activities in the Tacoma, Wash. and Portland, Ore. plants, making his headquarters at Tacoma.

☆ ☆

EVERETT C. GOSNELL, formerly manager of the chemical division for Lukens Steel Co. and its subsidiaries, has joined The Colonial Iron Works Co. as chemical and process equipment division manager. Mr. Gosnell brings to his position years of experience in corrosion problems and the design of chemical-processing equipment.

☆ ☆

C. RIDER BRANDAU, who has been associated with the sales department of Lukens Steel Co. since 1924, has been named manager of sales for the Baltimore district of Lukens and its subsidiaries, By-Products Steel Corp. and Lukenweld, Inc.

☆ ☆

W. D. LIGON has been appointed works manager of Westinghouse Electric Corporation's new Buffalo plant, into which the motor division is moving. Mr. Ligon will act as resident manager of the Buffalo plant during the time necessary to completely shift the division's operations from East Pittsburgh. He has been manager of manufacturing in the division since December, 1943.

☆ ☆

Four regional vice-presidents have been elected by F. W. Dodge Corp. to decentralize construction operations. The men elected are: J. T. LITTLE, regional vice-president for the eastern states; RALPH M. HAIRSTON, of Atlanta, southern states; CYRUS G. FANNING, of Chicago, middle west; and CARL S. BENNETT, of Los Angeles, western states.

☆ ☆

OSCAR W. NELSON, formerly general manager of the Beaver, Pa. plant, propeller division, Curtiss-Wright Corp., has been appointed vice-president and general manager of the Peoria plant for R. G. LeTourneau, Inc.

☆ ☆

M. G. SEDAM has been appointed vice-president in charge of research and production for Alloy Rods Co., York, Pa. Mr. Sedam has been associated with the company as director of research since 1943.

☆ ☆

L. E. VAIL has been appointed sales representative for Northern Ohio of the Titan Metal Mfg. Co., Bellefonte, Pa. His offices will be at 408 Carnegie Hall Building, Cleveland.

☆ ☆

R. N. LANDRETH has been named to direct the activities of Allis-Chalmers' Washington, D. C. district office. He succeeds RALPH R. NEWQUIST, resigned.

PAUL ABEL, formerly assistant chief engineer of The Yoder Co., designer and manufacturer of special metal-working machinery, was recently appointed chief engineer of the company.

☆ ☆

DANIEL R. SEAGRAVE has been appointed superintendent of service and erection in the Seattle district of the Allis-Chalmers Mfg. Co., Milwaukee, succeeding the late R. C. NORMAN.

☆ ☆

Died. . .

EDGAR L. FEININGER, assistant general manager of the chemical department of the General Electric Co., died recently while attending a company outing. He joined the company in 1912 as a chemist in the research laboratory.

☆ ☆

ROY H. CRANE, sales promotion manager for The Liquid Carbonic Corp., died suddenly, May 24.

☆ ☆

RUDOLPH LOUIS SUHL, manager of the nickel sales department of The International Nickel Co., N. Y., died suddenly at his home, June 10. During the war Mr. Suhl was a member of the ferrous alloys and minerals priority committee of the Office of Production Management.

SAVE TIME USE A
CMD
WELDERS CHIPPING HAMMER
With steel or wooden handle. Light weight. Strong. Easy to use. Write for circular.
TYPES EB and FB
Models E and F can be supplied with brush as shown here. Brush can be replaced by unscrewing countersunk screw in bracket and removing.
TYPE F
Head has two chisels at right angles.
TYPE E
Head has drift and chisel.
TYPE A
Has drift and chisel. Widely used in malleable and grey iron foundries for general chipping
TYPE CB
Combines 3 tools in 1—drift, chisel and removable wire brush.
TYPE C
Same as Type CB, but without brush.
CHICAGO MANUFACTURING AND DISTRIBUTING COMPANY
1928 WEST 46th ST., DEPT. W., CHICAGO 9, ILLINOIS

Helpful Literature Just Published

Unless otherwise stated, the publications reviewed in this section may be obtained without cost by writing to the manufacturers listed.

Spot-Welding Folder

A FOUR-PAGE, letterhead-size folder gives the details of the new "Besco" spot-welding tweezers for welding parts as small as 0.0005 in. round or thick. This bench welder consists basically of a pair of forged copper tweezers and a foot switch connected to a small cabinet. It plugs into a 115-volt, 60-cycle power and is available with an auxiliary booster which increases the machine capacity by 300%. TWEEZER-WELD CORP., 280 Plane Street, Newark 2.

☆ ☆

Design for Welding

A 28-page, 8½ x 11 in. booklet, "Weldment Designed and Fabricated by Lukenweld," pictures the complete engineering-welding facilities of this concern for the design and fabrication of medium and heavy weldments. The booklet has many convincing illustrations of the principle that proper design can bring about not a weld joint but a single piece of homogeneous steel. The products shown include all-welded press frames, flash welder components, engine frames, girder beams, gear blanks, etc. For each product, data are given pertaining to its design, construction and ability to withstand wear.

A final section covers the methods used to test various items. These testing procedures include microphotography, X-raying, Brinell testing, tensile testing, spectrograph examination and magnetic-particle inspection. LUKENWELD, INC., 279 Lukens Bldg., Coatesville, Pa.

☆ ☆

Underwater Cutting Article

A FOUR-PAGE reprint from *Engineering News-Record* on underwater cutting and welding as speeded and simplified by the electric arc process, should be of interest to salvage and repair foremen and engineers. This report was written by Charles Kandel, president of Craftsweld Equipment Corp. Through the use of the arc-oxygen process with a flux-coated waterproof rod, 15 to 20 ft welds per hour are possible. Recommended underwater values are given by Mr. Kandel for electrode size, current setting, number of passes, weld strength, static load and load when bending movement is involved for a ¾ in. horizontal fillet.

The equipment necessary for underwater cutting with this process includes all items found on the average job plus a fully insulated electrode holder consisting of a copper-alloy head to which a short length of leader cable is directly connected. The electrode is inserted through a holding device that establishes a firm electrical contact and at the same time seals the end into the oxygen supply. The average diver, working under ordinary conditions, will cut ½ to ¾ in. steel at an average rate of 25 to 30 ft per hour, the report states. CRAFTSWELD EQUIPMENT CORP., Long Island City 1.

☆ ☆

Grinding Wheels Handbook

A 32-page, multicolor handbook 5 by 7 in. gives complete details pertaining to grinding wheels and other products of practical foundry use. Emphasis is placed on the new B-5 resinoid for weld-grinding jobs of all kinds. Possessing the combination of speed and long life, this B-5 bond produces a mechanically strong wheel. For light pressure or a large contact area, 57 alundum abrasive is suggested.

Suggested specifications of Norton wheels for foundry grinding are listed for such varied applications as billet grinding, steel and annealed malleable castings, grey iron and unannealed malleable castings, brass, magnesium and aluminum castings. Information is also given for portable grinders using straight, cone and plug wheels and flaring cups. Also included are mounted points and wheels used for hard-to-get-at places and cut-off wheels for removing gates and risers, etc. With this interesting handbook is an insert describing Norbide nozzles for pressure blasting and Norton refractories. NORTON CO., Worcester 6, Mass.

Portable Tester Checks Tensions Up To 10,000 lbs.— Right at the Workbench!

Standing only 37" high, weighing but 137 lbs., the Dillon Universal Tester checks wire, copper, aluminum, fabrics, steel, etc. for tensile, transverse, compression and shear strengths. Available in 7 capacities, with interchangeable dynamometers, the Universal will test from 0 to 10,000 lbs. Special gripping jaws are made for every requirement.

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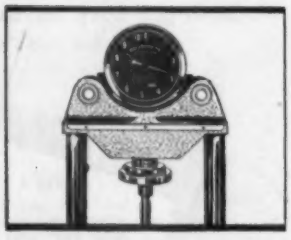

Interchangeable Dynamometer

AA-78

Metal Machining Bulletin

A 12-page, 8½ by 11 in. bulletin (No. 66) titled "The Machining of Ampco Metal" gives detailed information for the machining of six basic grades of aluminum-bronze alloy. The text explains the general principles on turning and boring which require the work and tool to be rigidly supported and the machine free from play. This is important in the use of carbide-tipped tools. For forming and grooving, the same principles apply. Sulphur-free soluble oils are recommended as a coolant. AMPCO METAL, INC., 1745 So. Thirty-Eighth St., Milwaukee 4.

☆ ☆

Flame-Hardening Catalog

A 16-page catalog (No. 90) describing the use of flame-hardening apparatus has been published by AIR REDUCTION SALES CO., 60 E. 42nd St., New York City 17. The text explains the use of water-cooled torches for hardening small parts and the more elaborate apparatus necessary for large jobs. Torches of the water-cooled type are listed with the proper mixing heads, extensions and mixer extensions. Flat-surface hardening types are listed with their respective features, size, width they will harden, flames per tip, operating pressure, gas consumption, etc. Clearly drawn diagrams show the correct mounting of these tips.

Gear-hardening apparatus and tips are also covered, and diagrams illustrate the size of tip to be used when hardening various sizes of gear teeth. The book concludes with helpful information on the correct tip to be used for flame-hardening rounds, the use of gas control equipment and the installation of gas pipe-line systems.

☆ ☆

Electronics Guide

A 28-page booklet, "The Business Man's Guide to Electronics," shows how this science is speeding production, saving time, saving materials and promoting safety in industrial plants. The text explains each of the six fundamental functions of electronic tubes—rectifying, amplifying, generating, controlling, counting and sorting, inspecting. Copies of this booklet, A-4726, may be secured from the WESTINGHOUSE LAMP DIVISION, ELECTRONIC TUBE SALES DEPARTMENT, Bloomfield, N. J.

☆ ☆

Copper Castings Bulletin

THE demand for American industry for copper-casting of higher conductivity is met by the development of "Ampcoloy 90," which is said to have a minimum electrical conductivity of 90%. A four-page bulletin (No. 81) describes and illustrates this product, which is recommended for such uses as: castings for resistance-welding machines, transformer secondaries, cable attachments, electrode holders for arc furnaces, contacts, bus bars, etc. AMPCO METAL, INC., 1745 So. Thirty-Eighth Street, Milwaukee 4.

Silver Alloy Bulletin

AMPCO bulletin No. 82 describes a new series of nickel-silver alloys containing from 20 to 30% nickel. This new series is made regularly in four alloys to answer the demand for a nickel silver uniform in physical properties and chemical composition. Each alloy is acid-resistant, corrosion-resistant, rustproof and easily cleaned. AMPCO METAL, INC., 1745 S. Thirty-Eighth Street, Milwaukee 4.

☆ ☆

Cutting Machine Bulletin

AIRCO "Camographs" Nos. 4 and 5 oxy-acetylene cutting machines are described in a new bulletin covering specifications, operation instructions and electrical requirements. This bulletin contains illustrations of both machines and has color diagrams of their respective cutting ranges. AIR REDUCTION SALES CO., 60 E. 42nd Street, New York City 17.

☆ ☆

Electrode and Rod Bulletin

A TWO-PAGE electrode and welding rod price list issued by THE CHICAGO HARDWARE FOUNDRY CO., North Chicago, tabulates compact information on cast-iron welding rods, and electrodes and cast-aluminum welding rods. Four welding and brazing fluxes are also listed.

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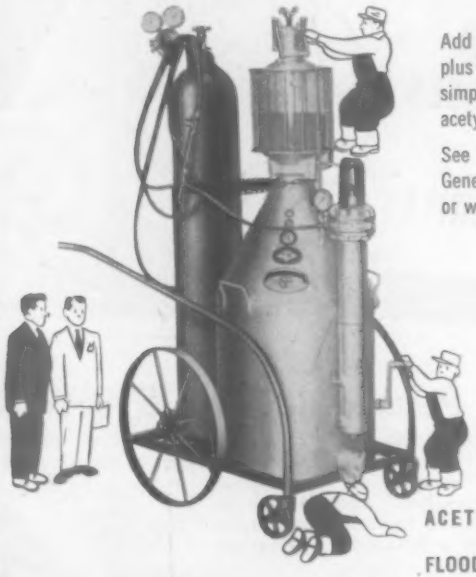

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Metal Processing Booklet

AN EIGHT-PAGE two-color booklet tells the complete story of the "Bart-Lectro-Clad" process of applying a corrosion-resistant surface to ordinary low-carbon steel tubing. A predetermined thickness of nickel or other corrosion-resistant metal is electrolytically deposited on the inside surface of the piece. The coating thus formed is said to be smooth, ductile, pore-free and fully adherent to the base metal. Materials so processed may be welded, reduced or bent hot or cold without destroying any portion of the internal plating. These applications are illustrated by photographic reproductions showing the advantages of the process. BART MFG. CO., INC., Belleville 9, N. J.

☆ ☆

Wrought Iron Welding, Cutting

A SERVICE bulletin from A. M. BYERS Co., Pittsburgh recommends practices for the welding and flame-cutting of wrought-iron pipe and flat rolled products. Proper welding procedures are important in the fabrication of radiant heating and automatic snow melting systems, as well as for other piping services employing wrought iron piping in the plumbing, heating, ventilating and/or refrigeration fields. The booklet contains a comprehensive welding chart that can be removed and tacked on the wall.

☆ ☆

Electrode Chart

A "comparative bronze electrode chart" contains the AWS-ASTM classification of bronze electrodes and the grade numbers of rods produced by fifteen manufacturers. Tradenames, classifications and numbers are listed for proper identification. This chart gives a graphic overall picture of the electrodes available and permits the user to select the type of bronze rod that most closely meets his requirements. AMPCO METAL, INC., 1745 S. Thirty-Eighth Street, Milwaukee 4.

☆ ☆

Steel Products Manual

SECTION 24 of the Steel Products Manual, a 158-page book, covers the broad subject of stainless and heat-resisting steels. Standard type numbers are listed with their chemical composition limits and ranges. Later sections cover plates, sheets, strip, bars, structural and bar shapes, round and flat bars. A long chapter is also included on the properties and thermal treatment of each standard type steel. AMERICAN IRON AND STEEL INSTITUTE, 350 Fifth Ave., New York City 1.

☆ ☆

Dust Collector Pamphlet

A FOUR-PAGE, letterhead-size pamphlet gives complete details on a new dust collector, which is said to remove all foreign particles and return warm, clean air to the room. IDEAL INDUSTRIES, INC., 1935 Park Ave., Sycamore, Ill.

Postwar Trade Handbook

A 100-PAGE hand book has been published by the Committee for Economic Development to assist manufacturers, wholesalers, jobbers and retailers in their plans for postwar international trades. Important data are listed for all phases of exporting and importing together with a chart showing the flow of international trade. Included is an appendix of commercial abbreviations used by the principal nations of the world, foreign trade definitions and field offices of the bureau of foreign and domestic commerce. COMMITTEE FOR ECONOMIC DEVELOPMENT, 285 Madison Ave., New York City 17.

☆ ☆

Microcast Process Guide

AN eight-page, letterhead-size booklet gives details of the "Microcast" process for the precision casting of industrial machine equipment. This is a "lost-wax" process employing an oversized master pattern made of brass or soft steel. Around this pattern is cast a split die or mold of a low-fusing, hard die alloy, and the wax is injected under reasonably high pressure into this metal mold. The pattern thus produced is then imbedded in a refractory mold mix containing a silica binder. After the mold has dried, the wax is dissipated by the use of steam or circulated dry air and subsequent heating to an elevated temperature. Casting is then done by air pressure, centrifugal force or vacuum. AUSTENAL LABORATORIES, INC., 224 East 39th Street, New York City 16.

☆ ☆

Iron and Steel Catalog

A 176-PAGE catalog published by the U. S. Government gives information on postwar prospects and problems of the iron and steel industry, uses, technology, trade opportunities, etc. This publication, catalog No. TC 1.18:15 (Tariff Commission, War Changes in Industry, Series report 5), may be obtained at 30c per copy from the SUPERINTENDENT OF DOCUMENTS, U. S. GOVERNMENT PRINTING OFFICE, Washington 25, D. C.

☆ ☆

Induction Heating Guide

A FOUR-PAGE, letterhead-size booklet containing information on "Illitron" induction heating for brazing, soldering and other applications has been published by the ILLINOIS TOOL WORKS, ELECTRONICS DIVISION, 2501 No. Keeler Ave., Chicago 39. Illitron units are offered in ratings of 1, 2.5, 5, 10, and 50 kw for operation on 60-cycle, three-phase power lines at either 220 or 440 volts.

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Dust Collector Booklet

INDIVIDUAL type "Dustkop" dust collectors suitable for collecting dust, dirt and lint from dry grinding, buffing, polishing, etc., are described in an eight-page catalog, A-350. AGET-DETROIT CO., 602 First National Bldg., Ann Arbor, Mich.

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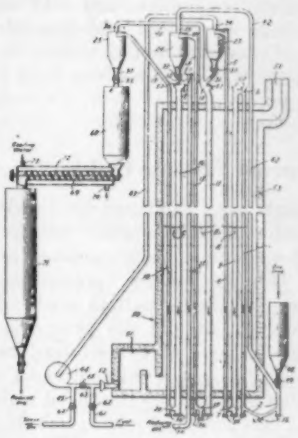
From the Patent Office



Flux-Cutting Process

2,399,984. LYLE CALDWELL, Los Angeles. Filed Oct. 2, 1943. Issued May 7, 1946.

A process of reducing iron oxide in suspension in a fuel gas at elevated temperature. The finely divided solid material containing iron oxide is subjected to successive stages of reduction by contact with a stream of fuel gas at high temperature and velocity. The solid material is first introduced into the gas entering the reduction stage and separated from the gas leaving each stage in a progressively increasing state of reduction. The solid material separated from the gas leaving each stage other than the last is reintroduced into the gas entering the next succeeding stage. The solid material separated from the gas leaving the last stage is discharged from the apparatus. Heat is supplied directly to the gas and suspended solid material in each stage.

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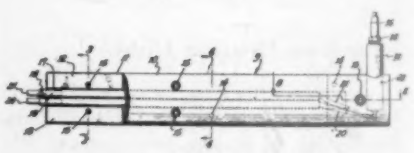

Spot-Welder Horn Assembly

2,399,797. BERNARD GROSS and LEO W. CORNWALL, San Diego, Calif., assigned to ROHR AIRCRAFT CORP., Chula Vista, Calif. Filed Sept. 2, 1944. Issued May 7, 1946.

The combination of a longitudinally split spot-welder horn with an electrode and electrode holder. The outer end of the horn and the electrode holder have connected passages for the circulation of water to and from the body of the electrode. Removable inlet and outlet water tubes are housed within the horn and connected with the passages to form a circulatory system for cooling the electrode.

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ALUMINUM SOLDER

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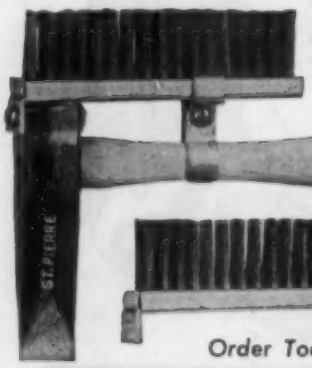

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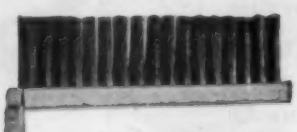

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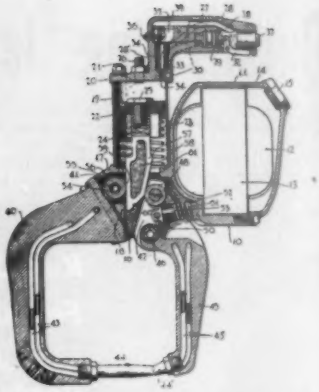


Portable Spot-Welding Gun

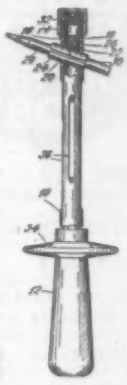
2,400,473. HAROLD A. STRIKLAND, JR., Detroit, assigned to BUDD WHEEL CO., Philadelphia. Filed Dec. 16, 1943. Issued May 14, 1946.

A portable spot-welding gun comprising a transformer casing, a motor and a pair of electrode holders. Motor and electrode holders are supported on one side of the casing; one of the holders has a pivot attachment to the support and an actuator for engaging the power element of the motor. A spring device is positioned between the actuator and pivot point to return the pivoted electrode holder to open position after release from closure by the power element.

☆ ☆

Electric Soldering Iron

2,398,946. HUGH JOSEPH LORANT and JOHN WILLIAM BRIDGELAND, London, England; said BRIDGELAND assigned to LORANT. Filed Dec. 31, 1943 (in Great Britain, Jan. 4, 1943). Issued April 23, 1946.



An electric soldering or brazing tool of the contact type comprising a conducting body and a handle. The body portion has two electrode-receiving holes that extend transversely at different angles and are in open communication with each other. Each transverse hole detachably contains a longitudinally split metal sleeve for receiving an electrode, the sleeves being arranged to engage one with the other within the body portion. A securing member is also carried by the body portion and is arranged to exert a clamping force on the sleeves; the clamping force is transmitted serially to the pair of sleeves in the absence of electrodes in one or both of the holes.

☆ ☆

Manganese-Steel Rod

2,400,249. RAYMOND L. MORRISON, Buffalo, assigned to MORRISON RAILWAY SUPPLY CORP., Buffalo. Filed June 2, 1944. Issued May 14, 1946.

A manganese-steel welding rod comprising from 5 to 20% manganese, 1 to 5% copper and nickel together, carbon from 0.1 to 2%, silicon from 0.1 to 2%, boron from 0.001 to 0.1% and the balance iron.

SPOT • BUTT • ARC
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AIR, FOOT or MOTOR Operated Press Type Welders of All Sizes.

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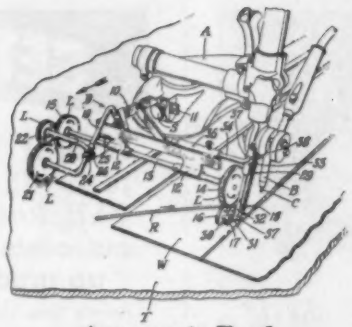

Automatic Feed

2,398,355. GAYLORD T. BRISTOL, Niagara Falls, N. Y., assigned to THE LINDE AIR PRODUCTS CO., New York City. Filed July 28, 1944. Issued April 16, 1946.

A rod-feeding device adapted to be attached to a carriage. It comprises a frame provided with a bearing for a freely rotating horizontal shaft. Roller wheels are mounted on the opposite ends of the shaft, and a surface-engaging drive wheel is mounted on a bracket attached to the frame. A motion-transmitting wheel is mounted on the frame and engages the drive wheel and one of the roller wheels. A pair of idler wheels bias a rod into engagement with the other roller wheel so that the rod is fed toward the work by movement of the carriage. All of the wheels and rollers are rotatable about parallel horizontal axes.

☆ ☆

Electrode Holder

2,397,252. CHARLES M. EGAN, La Mesa, and CARL H. LEDFORD, National City, Calif. Filed June 23, 1943. Issued March 26, 1946.

The combination of a hollow insulating tubular handle member with an electrical conductor connector support. The latter fits the interior of the handle member and is shiftable longitudinally therein; it is provided with a small extension member extending outwardly of one end of the tubular handle. An insulation member surrounding the extension member is provided with an annular and tightly fitting flange that rests against the connector support. The welding-rod holder is adjustably mounted on the extension member, and covered by an insulation member that overlaps the insulation surrounding the extension member.

☆ ☆

High-Frequency Arc Welding

2,399,331. CLINTON L. DENAULT, Sharon, Pa., assigned to WESTINGHOUSE ELECTRIC CORP., East Pittsburgh. Filed May 25, 1943. Issued April 30, 1946.

The combination of a high-frequency generator with an a-c arc-welding circuit. An a-c voltage is applied to the high-frequency generator in such phase relation to the welding circuit voltage that the high-frequency impulses are produced principally between the time that the instantaneous value of welding circuit voltage reaches an arc-sustaining value and when it is a maximum.

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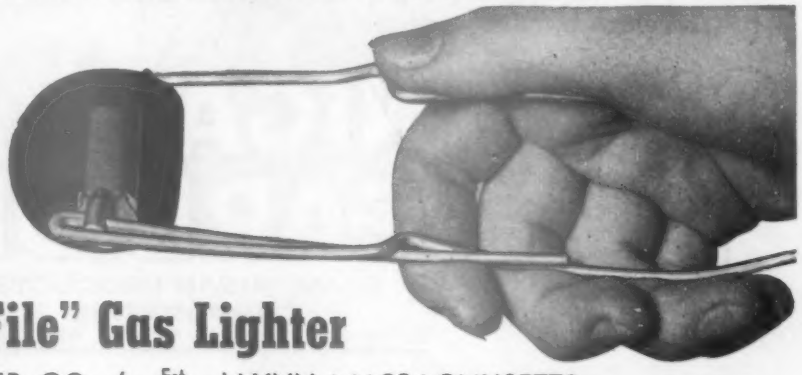

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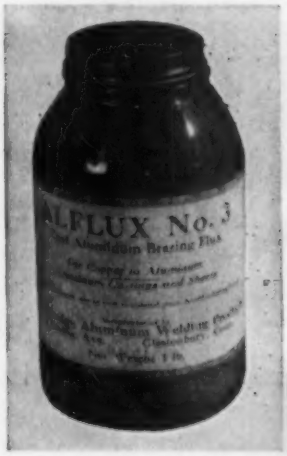

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Torch for Thermoplastics

2,396,968. WILLIAM M. PHILLIPS, JR., Detroit, assigned to THE UDYLITE CORP., Detroit. Filed April 16, 1943. Issued March 19, 1946.

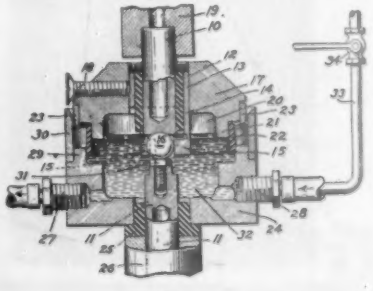
A torch for producing a hot gaseous blast for welding thermoplastic material. It comprises an elongated combustion chamber surrounded by an elongated casing which is spaced to form a passageway about the combustion chamber. The inlet in the casing is remote from the inlet in the combustion chamber. A combustible gas is introduced into the combustion chamber, and a combustion-supporting gas is introduced under pressure through the inlet casing. The latter gas flows through the casing in counter-current and heat interchange relation with the gases in the combustion preparatory to passing through the inlet into the combustion chamber. The products of combustion are cooled by the interchange below their combustion temperature preparatory to flowing through the outlet of the combustion chamber in the form of a hot blast. The gas in the casing cools it to a sufficiently low temperature for manually handling, enabling it to serve as hand grip.

☆ ☆

Cooled Spot Welder

2,397,263. FRANK B. HUNTER, La Canada, and JAMES C. ARNOLD, Los Angeles, Calif., assigned to ADEL PRECISION PRODUCTS CORP., Calif. Filed Aug. 9, 1944. Issued March 26, 1946.

In this spot-welding apparatus, each of the parts to be welded carries a section of a telescopable chamber that encloses both the parts and the electrodes. This chamber is supplied with a liquid coolant submerging the parts. Heat emanating from the juncture of the parts is absorbed by the coolant.



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High-Frequency Arc Welding

2,399,377. WILLIAM E. PAKALA, Forest Hills, Pa., and ALFRED B. WHITE, Murrysville Pa., assigned to WESTINGHOUSE ELECTRIC CORP., East Pittsburgh. Filed December 3, 1942. Issued April 30, 1946.

The combination of a relatively low-frequency arc circuit and a relatively high frequency generator with means, including an inductance, for coupling the high-frequency generator to the arc circuit and determining the value of the high-frequency voltage applied to the arc circuit. There is also a control, operable to shunt a portion of the inductance, to reduce and maintain the high-frequency voltage at a lower operating value. This assists in re-establishing the low-frequency arc circuit.

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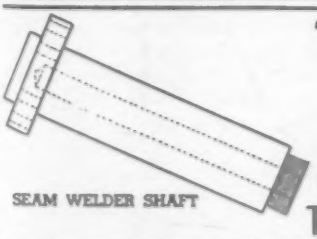

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Long Island City 1, N.Y.

Automatic Welding Method

2,399,356. Hans Klopstock, London, and Abram Rupert Neelands, Doncaster, England. Filed March 23, 1943 (Great Britain, Oct. 17, 1941). Issued April 30, 1946.

A method of welding plates along a seam. The adjacent edges of the plates are chamfered to form a trough between them, and a rod of welding metal is rotated at high speed in the trough in contact with the chamfered faces. The rod is simultaneously fed forward under such pressure that the frictional heat developed raises the metal plates and the operative end of the rotating rod to molten condition. The molten metal deposited along the trough from the end of the rotating rod amalgamates with the molten metal of the plates, and on cooling a homogeneous bond between the plates is achieved along the seam.

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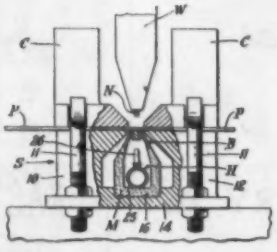

Heated Back-Up Strip

2,399,646. Walter R. Linden, Palisades Park, N. J., assigned to The Linde Air Products Co., New York City. Filed Oct. 23, 1943. Issued May 7, 1946.

A backing member for preventing distortion of sheet metal adjacent a seam being oxy-acetylene welded. It comprises a top portion conforming to the underside of the material being welded and a central portion that increases in width toward the bottom. Side flanges are spaced from and parallel to the downwardly diverging sides of the central portion to prevent warping of the backing member. The portion of the space between the depending side flanges adjacent each side flange is unobstructed to leave a clear passage for the flame.

☆ ☆

Welding Coated Members

2,399,815. Wesley G. Martin, Milwaukee, assigned to A. O. Smith Corp., Milwaukee. Filed Dec. 26, 1942. Issued May 7, 1946.

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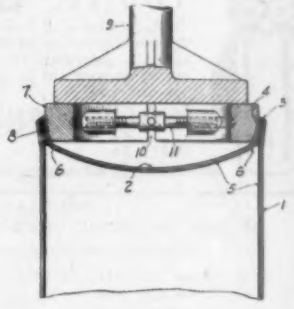

one of which has a ceramic enamel coating bonded to it. The method is designed to prevent the stress caused by weld contraction from injuring the coating adjacent to the weld. This is done by first stretching the uncooled weld in a direction opposite to its contraction and then supporting it against contraction while cooling. This procedure substantially reduces the elastic movement of the member under the influence of weld contraction.

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